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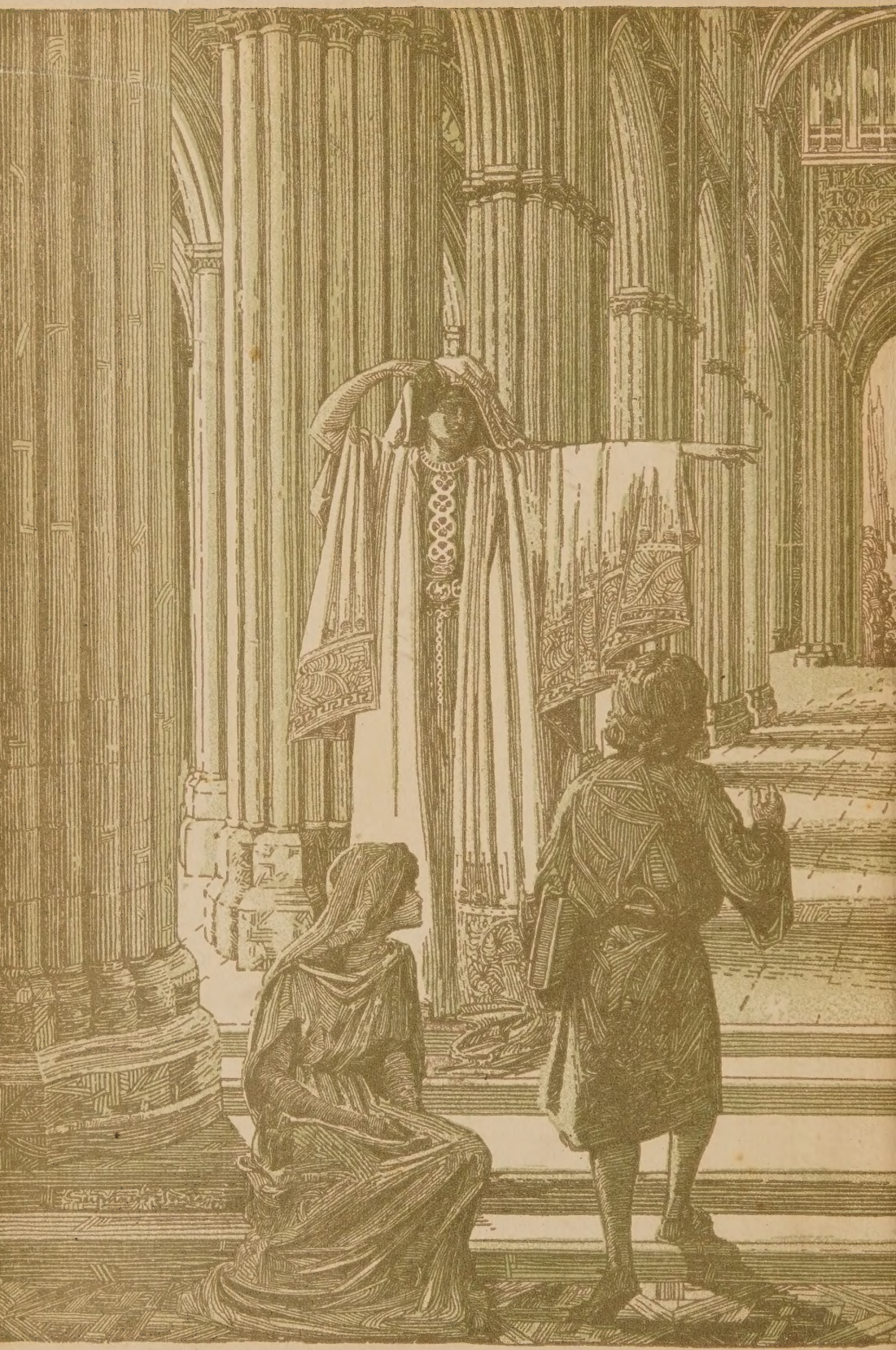

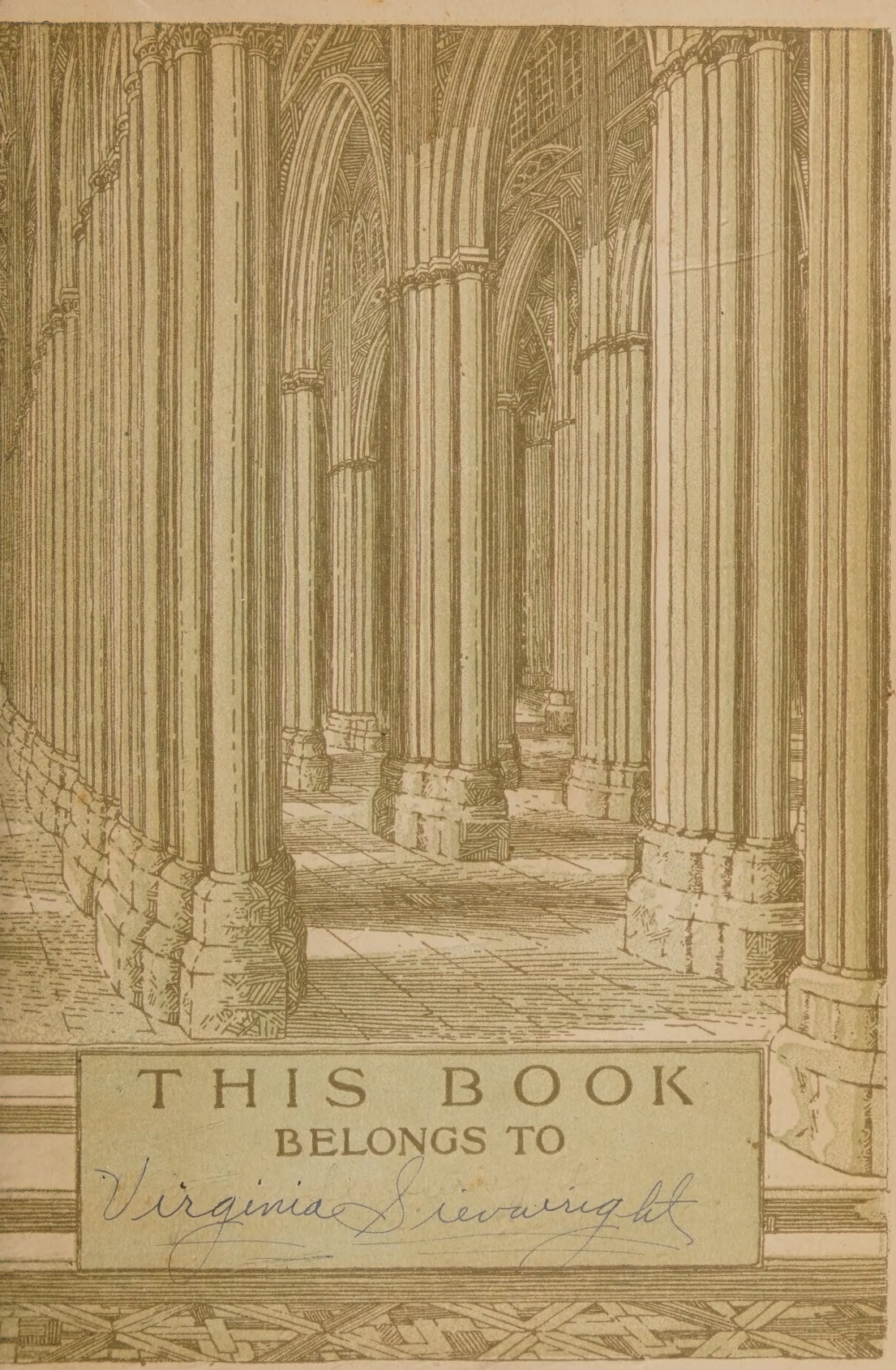
THIS BOOK
BELONGS TO
Virginia Sievwright

THE NEW

STUDENT'S REFERENCE WORK

FOR

TEACHERS, STUDENTS AND FAMILIES

EDITED BY
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THE SELF MASTER

By Dr. Frank Crane

EVERYONE of us wants to amount to something in the world. We want to be somebody and to do something worth while.

The most important thing for us to learn is that we cannot succeed with other people until we have learned how to succeed with ourselves.

No one can be superior to others until he is superior to himself.

The failures and the criminals of the world are made up mostly of those who never learned to control themselves.

It is natural that we should want good things to eat, but unless we learn how to use our will power and refuse to eat things that are harmful or to eat more than is good for us, we shall ruin our health.

It is natural for us to want to play, but unless we learn how to control this desire and make ourselves work when work is necessary, we shall never gain respect and reward.

The most manly boy is the one who has learned not to give way to all his feelings. We all admire the boy who does not cry when he is hurt nor complain when he loses nor sulk when he does not get his own way.

Everyone wants to have people like him. And the surest way to be disliked by everybody is to show that you have no control over yourself.

Those who have no self-control are unhappy; they are not only miserable themselves, but they make others miserable.

That boy or girl who is self-reliant is the one who is sure to win the esteem of other people.

The weaklings and the mollycoddles are always trying to get other people to help them, while the kind of a boy we like is the boy that depends upon himself.

The girl who is thoughtful of others, who tries to make others happy, and is not always thinking of herself, is the girl who is the greatest favorite.

Nothing is so important for us to learn as the fact that our enjoyment of life and our success in life depends upon ourselves.

We need strong bodies, strong minds and strong wills. This strength comes from self-discipline.

No help that we get from our parents, our teachers or from anybody else can take the place of the help we give ourselves.

Those who make their mark in the world are those who have developed a strength within themselves.

And best of all, those who are loved by everybody are those who are independent, cheerful and brave.

No one can expect to be master of other people unless he has learned to be master of himself.

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Chatham (*chăt'ăm*), Northumberland County, N. B., is the chief town on the gulf coast of the province, lying on Miramichi Bay, with a fine harbor and much activity in shipyards, mills, foundries and lumber. It has a population of about 5,000. To the southwest, along the Miramichi River, are the best salmon grounds in Canada.

Chat'ham, a city of 10,317 in western Ontario. Situated on the River Thames. Considerable manufacturing is done here. A carriage-manufactory is one of its largest industries. It is in the natural-gas and oil district. The district surrounding it is particularly rich and fertile. It is growing rapidly, its natural advantages proving attractive.

Chattahoochee (*chăt'tà hōō'chē*), a river in Georgia, which takes its rise in the northeast part of the state, in the Blue Ridge Mountains, and, flowing south, between Georgia and Alabama, unites with Flint River to form the Appalachicola. Its length is over 500 miles, and it is navigable for over 200 miles to Columbus. It is famous in literature as the subject of Lanier's poem, *The Song of the Chattahoochee.*

Chat'tanoo'ga, Tenn., a city, the county seat of Hamilton County, on the Tennessee River and on a number of railway trunk-lines. For eight or nine months of the year the river is navigable as far as Chattanooga. It is the seat of the University of Chattanooga, McCallie Preparatory School, Baylor School, Girls' Preparatory School, and also of Baroness Erlanger Hospital; it has many fine civic buildings, an opera house, public library and a number of attractive churches and fine schools. The city has a large trade in coal, iron, grain and lumber, its industries embracing the manufacture of steel and iron, machinery of various kinds, furniture, bricks and tiles, cotton goods, carriages and cars. In the vicinity is the Chickamauga National Military Park, marking the scene of the battle of Chickamauga (Sept. 1863). During the Civil War the city and neighborhood were the scenes of much and calamitous fighting, the city especially suffering. A sad evidence of the bloody struggle of the era is the national cemetery here, which contains about 13,400 graves. Population, 57,000.

Chattanooga, Battle of, a series of bloody engagements, in the Civil War, fought at Chattanooga, Tenn., and immediate neighborhood, Nov. 23-25, 1863, between the Federal army (60,000 strong) under General Grant and the Confederate forces (numbering 40,000) under General Bragg, and ending disastrously for the south. The battle had for its initial acts the expulsion of Bragg by Rosecrans from Chattanooga, and the battle fought at Chickamauga (Sept. 19-20, '63), in which the Union army was defeated and driven back to Chattanooga, where General Thomas, who had succeeded Rosecrans in command of the Army of the Cumberland, was besieged by Bragg. At this juncture General Grant, who had been placed in command of the northern armies operating in the region, came on the scene, bringing with him General Sherman with a part of the Army of the Tennessee, Hooker with reinforcements from the east having just preceded them. Ordering Hooker's corps to attack Bragg's left, Grant entrusted to Sherman the duty of attacking the southern right, while Thomas was to engage the center. Hooker forced his way up Lookout Mountain and had a notable engagement with the enemy in what is romantically known as the Battle above the Clouds, afterwards gaining a position on Bragg's left and rear. Sherman's attack met with stubborn resistance, and desperate fighting ensued without decisive results. Finally the forces under Thomas charged and carried the enemy's rifle-pits at the foot of the Ridge and in the absence of orders, rushed up the steep face of Missionary Ridge, and won the crest and the day. The storming of this Ridge has been noted as one of the most heroic achievements of the war, besides being vitally disastrous to Bragg and his army, which retreated toward Atlanta. See *War of the Rebellion Records*, also *The Army of the Cumberland* and *Battles and Leaders of the Civil War.*

Chaucer (*cha'sẽr*), **Geoffrey,** English poet and man of affairs, was born about 1340. Of his early boyhood we know nothing. At the age of seventeen we find him a page in the service of the wife of the Duke of Clarence, and at nineteen see him in the army of Edward III fighting the French, when he was taken prisoner, but later on was ransomed. He married about 1360 the sister of the future wife of John of Gaunt. He was given a pension by the king, and sent afterward to the Continent as commissioner or diplomat. In 1386 he lost two of the offices he was holding, why we know not, and from that time until his death misfortune pursued him. He seems never to have made provision for old age, and now many dark days came to him, though things went a little better when Henry IV, the son of his old friend, John of Gaunt, came to the throne. While on the king's business he visited Italy, and we find in most of his poems indications that his idea of poetry, what it is and should be, as well as his style and many of his plots and subjects, were taken from the great Italian poets, Dante, Petrarch and Boccaccio. The first of his great poems was *Troilus and Cressida*, but not until the darkness of poverty and old age came upon him, did he write the *Canterbury Tales*, of which the *Prologue* is the chief work. The *Tales* are related by a company of pilgrims on their way to Canterbury, who gather at an inn and agree each to tell a tale in going and returning; he who should

tell the best tale was to be treated by the others with a supper at the inn. Chaucer is known as the father of English poetry, and not only is he the first great poet of the race, but, in order of merit, he is among the first of all our poets. Chaucer wrote when the English language and spelling were not yet fixed, and one needs almost to learn a new language to read him, though some of his poems have been published with modern spelling and explanatory notes. Spenser called him "that welle of Englishe undefyled." The poet died about the year 1400, and was buried in Westminster Abbey.

Chaudiere (*shō'dyâr'*), a Canadian river about 120 miles in length, which flows through the southern portion of the province of Quebec. Its source is in Lake Megantic, near the border of the state of Maine and it joins the St. Lawrence opposite Quebec, or, rather, some seven miles above the historic city. Near its mouth occurs one of the cataracts known as Chaudière Falls, whose height is about 100 feet. Another cataract of the same name occurs in the Ottawa River, near the Dominion capital.

Chautauqua (*shâ-tą'kwâ*), a popular resort on Chautauqua Lake, New York state. Here Lewis Miller founded in 1874 the Chautauqua Assembly to give instruction to Sunday-School teachers, and out of it grew the wider Literary and Scientific Circle, "to direct the reading habits of grown people." It consists of a fou years' course of home reading under the oversight of the Chautauqua officers. There are about two hundred thousand members of the circle, scattered over the world. Dr. John H. Vincent, chancellor, was the best exponent of the spirit of the institution. As expressed by him, the "Chautauqua idea" is "a plea for universal education." He was convinced that "a college is possible in every-day life if one choose to use it."

Checkers or **Draughts,** a popular game, supposed to have come in early times from Egypt, and played on a board, somewhat after the chess-board pattern, in various ways in many modern countries. The familiar form is that played by two persons, each being given 12 checkers, (one using the white ones and his opponent the black, or *vice versa*), on a square board, divided into 64 equal squares, alternately black and white, the checkers at the beginning of the game being placed on the three near lines of squares (usually on the black ones). The moves are made diagonally across the board on to an unoccupied square, with the design, at close range of one's adversary, of capturing his men by jumping over the piece and removing it, the moves being made diagonally to a square unoccupied and clear to land on. The jump or move may be continued, if other men on the opponent's side are also exposed to capture, when they are similarly leaped over and removed from the board, provided that there be again a vacant square to occupy in making the leap. When the opponent's back line of squares is reached and occupied, the player gets his man kinged or crowned, by placing another checker of the same color on top of it. This kinged man is then free to move back and forth on the board, one square at a time (unless checked by the adversary), and is thus in a more favorable position to win the game. For further details see any checker's manual or treatise on games.

Chelsea (*chĕl'sĕ*), a western suburb of London, England, on the north side of the Thames. The town has been the home of many famous English characters, Sir Thomas More, Princess Elizabeth, Walpole, Swift, Carlyle, George Eliot and others. It is widely known as the seat of Chelsea Hospital for old and disabled soldiers, whose foundation-stone was laid by Charles II in 1682. About 550 pensioners are housed here, but all of the pensioners of the empire (about 88,000) are called out-pensioners of Chelsea.

Chelsea, a city of Suffolk County, Mass., population, 43,121. Chelsea is a suburb of Boston; it was settled as a part of Boston in 1625, was set off as a town in 1739, and became a city in 1857. It is connected with Boston by railroad, electrics and ferry. This ferry, the Winnisimmett, is the oldest in the country, dating from 1631. While most of its citizens do business in Boston, manufacturing interests have increased. Wall paper, clocks, boxes, boots, shoes, brass goods, pottery, rubber goods and hard-wood veneers are among the products. There are excellent schools, church and social organizations and a public library. A United States naval hospital faces the Mystic River, which separates Chelsea and Charlestown. In area the city is very compact, comprising little more than two square miles. In 1908 it was almost completely destroyed by fire.

Cheltenham (*chĕlt'nam*), a fashionable watering place in Gloucestershire, England. Its popularity came first from the benefit George III got by drinking its salt-spring waters. There are several colleges and fine buildings, and the absence of manufactures makes it a pleasant place to live in. Population 50,842.

Chemistry. The science of chemistry deals with the nature and composition of substances and with a certain class of changes which substances undergo. Chemical changes produce substances which are permanently different from the things from which they are formed. They take place when anything burns, ferments, decays or rusts; when substances combine to form new substances or when they are divided into other things; also when substances exchange some of their constituents. Examples of chemical changes are the explosion of gunpowder, where the

solid substance disappears and products which are largely gases are formed; the burning of a candle, where the fat or wax combines with oxygen from the air to form water-vapor and carbon dioxid; the rusting of iron, where a brown earthy substance is produced by the slow action of oxygen and moisture; the destruction of sugar by heating, where water-vapor and pungent gases come off and charcoal, a form of carbon, is left behind; the slaking of quick-lime, where water combines with the lime and much heat is produced; the action of metallic zinc in a solution of lead acetate, where zinc changes place with lead and a lead-tree is formed, together with soluble zinc acetate. The most careful experiments have shown that no gain or loss of total weight takes place during any chemical change. Matter cannot be destroyed, therefore, nor can it be produced in any circumstances whatever. This fact leads to the statement that there is a law like this in regard to energy. Physical changes are distinguished from those that are chemical in being merely changes of condition. For example, when a piece of glass is heated to redness it becomes soft, but it remains unchanged chemically and has the same composition and properties after it has cooled; when water is changed to steam by heating or to ice by cooling, it undergoes no chemical change, for the steam and ice may be readily turned into water again; when a piece of sulphur is crushed to powder the change is merely physical, for every one of the small particles is still sulphur; when common salt is dissolved in water it undergoes a physical change, for it may be regained unchanged by boiling off the water.

Chemistry has to do with the composition of all substances; not only those that occur naturally in the earth as minerals, or are produced by plants and animals, but those that are prepared artificially by chemical changes. Analytical chemistry deals with finding out what is contained in substances. This is qualitative analysis when only the identity of the constituents is sought, while it is quantitative analysis when their quantities are determined. A vast amount of research has shown that the innumerable objects that have been analyzed contain comparatively few kinds of matter or *elements*. As far as we know, each element contains only one thing, and all the evidence goes to show that it is impossible to change any element into another, even to the slightest extent. At the present time seventy-six elements are recognized by chemists, as follows:

Gaseous non-metallic elements. Argon, chlorine, fluorine, helium, hydrogen, krypton, neon, nitrogen, oxygen and xenon.

Other non-metallic elements. Boron, bromine, carbon, iodine, phosphorus, selenium, silicon and sulphur.

More common or important metallic elements. Aluminium, antimony, arsenic, barium, bismuth, cadmium, calcium, chromium, cobalt, copper, gold, iron, lead, lithium, magnesium, manganese, mercury, sodium, nickel, platinum, potassium, silver, strontium, thorium, tin, titanium and zinc.

Rarer or less important metallic elements. Beryllium, cæsium, erbium, gadolinium, gallium, germanium, indium, iridium, lanthanum, molybdenum, neodymium, niobium, osmium, palladium, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, thallium, thulium, tungsten, uranium, vanadium, ytterbium, yttrium and zirconium.

Most of the elements included in the last list are exceedingly rare, and are found only in minerals which occur in small quantities and in but few places. The elements given in the other lists vary enormously in their abundance. About one fifth of the atmosphere, exactly eight ninths of pure water and nearly one half of the earth's crust are made up of oxygen. Silicon, which occurs in combination with oxygen as quartz and in silicates, is next to oxygen in abundance, while calcium, the metal of limestone, and aluminium, the metal of clay, occur in large quantities. Magnesium, iron, potassium and sodium are also very important constituents of rocks; carbon, oxygen, hydrogen and nitrogen make up the greater part of plants and animals; but calcium, phosphorus, potassium, sulphur, iron and a few other elements are also required by living things in larger or smaller quantities. Plants get their carbon from the carbon dioxide of the air; hydrogen and oxygen are taken in by the roots in the form of water, and from the soil also are taken the nitrogen and the other elements that plants require. Animals obtain their nourishment directly or indirectly from plants, so that they contain no elements that are not found in vegetable matter. The term, organic chemistry, originally referred to the chemistry of the substances produced by plants and animals, and it was formerly supposed that these substances could be produced only by living organisms. Many of the products of life, however, such as alcohol, some of the sugars, indigo, oil of wintergreen and many others, have now been made artificially, so that there is no necessity for classifying these products by themselves. For convenience, however, substances containing carbon, the characteristic element of living things, are still called organic, and they include a vast number of artificial substances that do not occur in nature. The chemistry of all substances that do not contain carbon is called inorganic chemistry.

All substances that are not elements are either mixtures or chemical compounds, containing two or more elements. These two classes are to be distinguished by the fact that compounds do not vary in composition, while mixtures may vary greatly. Examples

of chemical compounds are water, composed of hydrogen and oxygen; sugar and alcohol, both of which contain carbon, hydrogen and oxygen; common salt, which is made of sodium and chlorine and has the chemical name of sodium chloride; quartz, called silica or silicon dioxide, which contains silicon and oxygen; and potassium chlorate, which is composed of potassium, chlorine and oxygen. Different samples of any chemical compound, when pure, always contain the same elements in exactly the same proportions by weight or in definite proportions. The same elements often form several compounds by combining in several different proportions; there are hundreds of compounds containing only carbon and hydrogen. It is true, also, that the same elements, combined in exactly the same proportions, may form a number of entirely different substances. This last fact, as well as many other chemical facts, is explained by supposing that the elements are composed of exceedingly small indivisible particles called *atoms*. All the atoms of each element are believed to be alike, and atoms of different elements are supposed to make up the molecules or smallest possible parts of compounds. The existence of several compounds of the same composition is explained by assuming that the atoms have different arrangements in the molecules. The atomic theory has been developed so elaborately that chemists are able to assign definite relative positions to the atoms in the molecules of a great many compounds, and the relative weights of the atoms of most of the elements have been determined with great accuracy, although their actual weights are unknown. However, since atoms have never been seen (and in all probability never will be seen on account of their small size), their existence cannot be said to be proven.

Most of the substances met with in everyday life are mixtures of chemical compounds. Such are most articles or materials of food and raiment, wood, bricks, paper, glass, rocks, soils, etc. There are a few familiar mixtures of elements, such as metallic alloys, steel and also atmospheric air, which consists chiefly of nitrogen and oxygen.

Our present chemical theories and the greater part of our chemical knowledge have been developed in comparatively recent times. The discovery of oxygen by Priestley in 1774, the correct explanation of combustion shortly afterward by Lavoisier and the founding of the atomic theory by Dalton during the first decade of the last century were important events which mark the beginnings of modern chemical science. Chemical knowledge is still rapidly increasing. In both the inorganic and the organic fields natural substances are being examined, new compounds are being prepared and the laws which govern chemical changes are being studied.

Chemistry has given and is giving much assistance in a practical way to medicine, agriculture, metallurgy and many other branches of art and industry, and still more important advances in these directions are to be expected in the future.

HORACE L. WELLS.

Chem'otax'is (in plants), the sensitiveness of an organism, free to move about, to a onesided chemical stimulus (see IRRITABILITY), to which it responds by taking up a definite attitude with respect to the direction from which the substance is diffusing. Since no plants (except possibly the myxomycetes or slime-moulds, which see) are free to orient themselves thus unless they are immersed in water, it follows that the substance in order to act must be soluble and diffusible in water. Thus the sperms (male cells) of mosses will so place themselves in a diffusing current of sugar particles that, as they swim, they move toward the source of the sugar. Such agencies are believed to determine the movement of the sperms toward the egg in many plants.

Chemot'ropism (*kē-mŏt'rō-pĭz'm*), the sensitiveness of a plant to a onesided chemical stimulus (see IRRITABILITY) to which it responds by changing the rate of its growth in certain regions, and thereby putting the part affected in a new position with respect to the diffusing particles. It differs from chemotaxis only in the nature of the reaction. Diffusing gases or solutes (but usually the latter) may effect the reaction. Thus the growth of the germ-tubes arising from growing spores of fungi is directed by their chemotropism. When, for example, a spore falls upon a leaf on or in which the fungus can develop, it sprouts, and when the young germ-tubes reach the stomata (which see), they turn in and ramify in the interior. Or they may penetrate an epidermal cell at once. It has been shown in both cases that the directive influence is the presence of foods in the leaf. The pollen-tubes are similarly controlled in their growth down the style to the ovules (see FERTILIZATION).

Che'ops. See PYRAMIDS.

Cherbourg. See BREAKWATER.

Cherokees (*chĕr'ō-kēz*), a tribe of North American Indians who were found by the whites in possession of the upper valley of Tennessee River and the rivers and mountains of the Alleghenies, and occupying 64 towns. Meeting the English colonists first, they became their friends and took part with them in the wars against the French. During 1757–61 they were most of the time at war with the English, the trouble growing out of robberies of provisions from the settlers by the Cherokees, who were driven to thievery by hunger on the homeward march, after fighting for the colonists. They yielded to the whites, after losing most of their houses, cattle and horses. During the Revolution they took the side of the British. After the

war a part of the tribe moved west of the Mississippi to find better hunting-grounds, and in 1838 the government removed the remainder. In the Civil War they divided, Cherokees being in each army. The tribe learned several kinds of manufacturing, gradually gave up hunting, and up to the outbreak of the war held many slaves. There have been schools and missions among them for a long time. They are also rich, the government holding for them over $1,500,000. They number about 14,000.

Cher'ry, certain species of the genus *Prunus*, which belongs to the rose family. The cultivated tree-cherries are said to have come from two European species. The berries are also distinguished in general as sweet and sour cherries. It is the latter kind which is usually cultivated for canning, the sweet cherries being mostly confined to dooryard planting. In Japan cherries are specialized for their beauty, Cherry-blossom time being a holiday season. Our wild red cherry, pin, bird or pigeon cherry, is a graceful little tree, its bark smooth and shining, its leaves ever twinkling, and none could pass it by unnoticed in April and May, then all snowy, fragrant bloom. Its rich red fruit is a prime favorite with the birds. This tree, a quick grower and short-lived, is an excellent nurse for young forest trees. The choke-cherry is generally but a shrub, though attaining considerable size in the region lying between Nebraska and northern Texas. Both in time of blossoming and in fruit-bearing it is very attractive, the blossoms having long, fleecy bunches. Later the branches droop with the long stems aset with glowing gems, changing through various shades of yellow and red to the dark crimson of the ripe fruit —occasionally yellow when ripe. The fruit is very good to look at but very bitter to eat, puckery and harsh to the taste.

The wild black cherry or rum-cherry, is a very valuable timber tree. It grows to the height of 50 to 90 feet, the polished wood, a rich, lustrous brown, rivalling mahogany and rosewood. It was once abundant on the Alleghany slopes, but is now quite scarce. See Rogers: *The Tree Book*; Lounsberry: *A Guide to the Trees*.

Cherubini (*kā-roo-bē'nē*), **Maria Luigi Carlo Zenobio Salvatore,** an Italian composer, was born at Florence in 1760. He began to study music at the age of six. He produced successful operas, and in 1800 brought out one of his masterpieces, *The Water-Carrier*. Soon after he turned his mind to church-music, in which he became very distinguished, his first work being the *Mass in F*. His operas resembled Mozart's in many respects. He died March 15, 1842.

Chesapeake Bay (*chĕs'ȧ-pēk*), meaning mother of waters, the greatest inlet in the Atlantic coast of the United States, enters Virginia and extends into Maryland. It is 200 miles long and from four to forty miles wide. Cape Charles and Cape Henry mark its entrance. It receives the Susquehanna, Potomac, James and other rivers. The Chesapeake is so deep that the largest ships can steam up its entire length. It is also the most southern of the deep-water bays, all those to the south being shallow.

Chesapeake, The, a frigate of the United States Navy, historically noted in the War of 1812 with Great Britain and in the preliminary impressment-controversy period. The latter period was the one when the British government refused to recognize the naturalization abroad of her subjects as absolving them from their inalienable allegiance. In the intercourse between this country and England, early in the last century, it was a frequent practice on the part of British seamen, when their ships touched at American ports, to desert and become American subjects. This naturally offended England and annoyed the captains and officers of her ships when desertions occurred on this side; so much so that it became a frequent occurrence to overhaul American ships and take from them deserters and even American subjects on the high seas. One instance of this connects itself with the United States frigate, *The Chesapeake*, which soon after sailing from Hampton Roads, on June 22, 1807, was overhauled for deserters by the British warship *Leopard*. Though unprepared for action, *The Chesapeake* resented the insult to the American flag and refused to submit to inspection or to surrender any of the foreign portion of her crew. At this *The Leopard* opened fire and forced *The Chesapeake* to haul down her flag and give up the three colored deserters aboard her. The unfriendly act, though disowned by Britain (the government of the latter refusing all redress) did much to embroil the two nations and precipitate the War of 1812-14. When the latter was in progress, *The Chesapeake* was again to figure in a sharp encounter with a British warship, *The Shannon*, commanded by Captain Broke and carrying 52 guns. On this occasion, *The Chesapeake*, which was then commanded by Captain Lawrence, and had an armament of 50 guns, was in better shape than formerly to take her part in the action that followed, save that she had a practically untrained crew. The two frigates met just outside of Boston. on June 1, 1813, and at once an engagement ensued. So hot was the *Shannon's* fire, and so indifferently was it returned by her American adversary, that the encounter lasted but fifteen minutes, when *The Chesapeake* was forced to surrender, in spite of her gallant captain's charge to his men, as he was carried below mortally wounded: "Don't give up the ship." *The Chesapeake* became *The Shannon's* prize, and was taken by the latter into Halifax harbor, afterwards and for a few years sailing under the British flag. The casualties of the encounter were

many on both sides; out of a crew of 379 *The Chesapeake* lost 61 in killed or mortally wounded, and 85 more or less severely wounded; *The Shannon's* losses (out of a crew of 330) were 33 killed and 50 wounded. See Cooper's *History of the Navy of the United States* and Roosevelt's *The Naval War of 1812*.

Chesapeake and Ohio Canal, a project, favored in 1774 by Washington, to connect the great inland lakes by a navigable waterway from Lake Erie across the Alleghenies, utilizing the affluents of the Ohio River, thence to tidewaters on the Potomac. The undertaking was not in his day put into effect; though in 1820 it was revived by the state of Virginia, and a company was organized to construct the Chesapeake and Ohio Canal, from Georgetown, D. C., to Cumberland, Md., by utilizing the waterway of the Potomac and tunneling the mountains beyond Paw-Paw Bend, thence to Cumberland. The project was completed in 1850, at a cost exceeding 11¼ million dollars. The canal has a length of 185 miles, and by means of about 75 locks (100 feet in length by 15 feet in width) it gains a total elevation of over 600 feet, the water being supplied by the Potomac. The depth of the canal is 6 feet, while its width to Harper's Ferry is 60 feet on the surface and 42 feet at the bottom. The continuation of the canal to tap the inland lakes is a matter still in the future; though of late the city of Pittsburg, Pa., has taken hearty interest in the scheme, both by urging the Federal authorities to carry the canalization of the Monongahela River south to Fairmont, W. Va., and by planning to construct a canal, 16 feet deep and estimated to cost over $30,000,000, from Pittsburg to Ashtabula, Ohio, on Lake Erie.

Chess, a game played with pieces of different value upon a board chequered in two colors and divided in sixty-four squares, is the most ancient of all the current games of skill. Chess is probably of Asiatic origin, although a game similar to it was known to the Egyptians. One of the earliest books to be printed in English was Caxton's *Ye Game and Playe of ye Chesse* (1479). The literature upon chess is at the present time enormous.

The pieces at the disposal of each player are a king, a queen, two bishops, two knights, two castles or rooks and eight pawns. The king moves in any direction one square; the queen, so far as the board is free, either diagonally or horizontally; the bishop, diagonally on its own color; the knight, one square horizontally or vertically and one square diagonally; the castle, horizontally and vertically; the pawns, to the next square in front. For the peculiar moves in castling, capturing and moving two squares with pawns, and "queening" the pawn, the reader is referred to books upon chess.

In theory, since the forces of each player are equal, every game of chess if rightly played should end in a draw. But the charm of chess arises from its infinite variety. No two games are alike. None the less, the best openings in chess have been reduced to a science, so that the earnest student of the game needs to practise the standard openings as given in books. There is no better plan for the learner than to play over the published games of the great masters.

The strategy of chess imitates that of war. The king is for each player the final object of attack and defence. Often, however, it is better to direct the attack upon some other piece, and to weaken the enemy before attempting to checkmate him. A king is checkmated when he is attacked in such a manner that if he were not the king he must needs be taken. The value of chess as a mode of mental recreation is almost beyond praise. At the same time it may be too serious a study for the good of the scholar whose mind is overtaxed by mental work. Moreover, the virtue which chess is held to possess, of training the mental powers for other purposes than the game itself, would seem to have been exaggerated.

Ches'ter, a city in Delaware County, Pa., on the Delaware River, 13 miles from Philadelphia. It has a military and other colleges, shipbuilding yards and manufactures cotton and woolen goods, engines, etc. It was founded by the Swedes in 1643, and is the oldest town in the state. Population 40,000.

Ches'terfield, Philip Dormer Stanhope, Lord, was born in London, Eng., Sept. 22, 1694. He studied at Cambridge, and was a member of Parliament. He was acquainted with Swift, Pope, Johnson and other authors. It was by offering his patronage to Dr. Samuel Johnson, after his famous dictionary appeared, though he had withheld it before, that he drew from the indignant Johnson the witty letter declining the courtesy that is so famous in English literature. Chesterfield is best remembered by his *Letters to His Son*. He died March 24, 1773.

Chest'nut, species of the genus *Castanea*, which is closely related to the beech. There are about five species, which occur in the temperate regions of northeastern America, Europe, northern Africa and Asia. The peasants of Italy and Spain regard the chestnut as quite important. This chestnut is not sweet like ours, but very good when cooked. Three species are cultivated in this country for the fruit, namely, the European chestnut (*C. sativa*), also known as French, Spanish and Italian chestnut; the American chestnut (*C. Americana*); and the Japanese chestnut (*C. crenata*).

The European chestnut is a tall, spreading tree the burrs very large, the nuts larger than the American chestnut, The Japanese chestnut is a dwarfish, slender tree and

bears very large nuts, in quality generally not equal to the other chestnuts, though excellent when cooked.

The American chestnut rises to a height of 60 to 100 feet, and is a symmetrical tree with a heavy top. The bark is gray; the glossy leaves, from six to eight inches long, taper at both ends, making foliage of marked beauty and abundance; the flowers are catkins, which open in June and July and exhale a sweet heavy odor; two to three nuts are the fruit. The nuts hold

CHESTNUT

first rank among chestnuts, and are marketed in large quantities from the forests of the Appalachian region, from Maine to Georgia in the east and westward to Michigan, Mississippi and Louisiana. The tree is a valuable lumber-tree, the wood being used for interior finish, for furniture, railroad ties, fence posts and fuel.

A miniature chestnut is the chinquapin, occurring from Pennsylvania to Florida and west to Arkansas and Texas; in the last two states reaching the dignity of a tree, east of the Mississippi only a shrub. A single sweet nut is its fruit. Chinquapin nuts are on sale in their season in the markets of southern towns. The horse-chestnut does not belong to the same family as the above, but is treated under horse-chestnut. See Rogers: *The Tree Book;* Bailey: *Cyclopedia of American Horticulture;* Hodge: *Nature Study and Life*, chapter on Elementary Forestry.

Cheviot (*chē'vĕ-ŭt*) **Hills,** a mountain range in Northumberland and Roxburgh Counties, on the English and Scotch borders, 35 miles long. These hills are used as pasture-lands by the fine Cheviot breed of sheep. Here were fought many bloody battles between the Scotch and the English, and the name is commemorated in the famous old ballad of *Chevy Chase.*

Chevy Chase. See BALLADS.

Cheyenne (*shī'ĕn'*), the capital of Wyoming. It was founded in 1867, when the Union Pacific Railroad reached that point. It has large railroad shops, is a supply point for surrounding ranches and mining camps, and is a shipping place of beef-cattle. Many cattle-men and mine-owners live here. Population, 11,320

Cheyennes, a tribe of Indians belonging to the great Algonquin family. They were found by the travelers, Lewis and Clarke, in 1803, on the Cheyenne River near the Black Hills. The tribe afterward divided, one part remaining in the north, joining the Sioux and fighting against the Crows; the other going south to the Arkansas and joining the Arapahoes. Treaties were made between both bands and the United States; but failure to carry out a treaty made in 1861 and an inhuman attack, made in 1864, by whites on what is known as Sand Creek village, killing 100 Cheyenne men, women and children drove the tribe into the field against the whites for the first time. This war cost the government many lives and about $30,000,000. The troops of General Hancock and Custer, in 1867, forced them to go on a reservation. The Cheyennes do not take kindly to schools. They number about 3,500.

Chicago. In the University of Chicago, there is a relief map which shows that the site of the second city in the United States and the fourth in the world, was, at no very remote age, covered by the waters of Lake Michigan. You would have had only to watch workmen excavating earth for any one of the nearly 12,000 buildings erected in 1912 to see the sand of this ancient beach turned up. In December, 1674, when Pére Marquette was guided to the Chicago River by Pottawattomie Indians, the plain was no more than six feet above lake-level—a dreary, frozen marsh, bounded by a wooded ridge ten miles back, the old shore-line, and relieved only by two low elevations of glacial drift—Stony Island (gravel) and Blue Island (clay). The saintly Jesuit, on his way to found a mission among the Illinois Indians, was conducted along the route that had long been used by the many Algonquin tribes of the upper lakes and the middle Mississippi. When the ice broke up and flooded the plain, the canoes were paddled out to the ridge, carried across a couple of miles and set afloat on the westward flowing current of the Desplaines. La Salle saw the strategic importance of the route and fortified Starved Rock on the Illinois. In 1803 the United States government built Fort Dearborn on the Chicago River to control the Indians around the head of the lake. Hither, in the same year, came John Kinzie, fur-trader and silversmith, with his family, to barter with the many tribes that used the Chicago trail or gathered here for council.

As the farthest point inland to be reached over the Great Lakes, with the shortest portage to the Mississippi system, nature

had endowed the spot, but had set it in a slough 960 miles across a hostile wilderness from the seaboard. The horrid massacre of Fort Dearborn August 15, 1812, was not followed by peace with the red man for 20 years. After the Black Hawk War (1831), the Indians of northern Illinois were removed to Iowa, and the vast region of fertile prairie behind Chicago was open to settlement. The town was organized in 1833 with 28 voters. In 1837 it was incorporated with a population of 4,497, which was but a fraction of the number that in five years had swarmed through the gateway. In 1848 it had grown to 20,000. It became plain to the least imaginative that if Chicago was to get any great advantage from its position, means must be provided for bringing in the products of the farms and for distributing supplies. It was easier and cheaper for settlers on the streams to load grain and cattle on flatboats and send them to St. Louis, than to haul loads across Chicago's ten miles of slough. The Illinois and Michigan Canal connecting the Chicago and Illinois Rivers along the old canoe-trail, opened in 1848, extended Chicago's trade a hundred miles westward and taxed its shipping facilities. In the early 50's William B. Ogden overcame incredible financial difficulties, and pushed ten miles of railway (the North-Western) out to the boat-landing on the Desplaines. The first train out found a cargo of grain piled on the bank. From that small beginning of a half century ago Chicago has become the greatest railroad center in the world, the terminal of 36 lines, aggregating a mileage of 91,672 miles, or over 40 per cent. of the total mileage of the United States, with gross revenues of $2,900,000,000.

With a death-rate in the 50's that must wipe out the entire population in 40 years, Chicago undertook the colossal task of pulling itself up to a 20-foot level. For the first time in history four-story brick and stone buildings were hoisted on jack-screws 12 to 14 feet in the air without interrupting business. The sand-bar that turned the river a half mile south to seek an outlet, was used to raise the grade of the streets; the river was cut straight out to the lake; the channel and harbor were deepened; and pumping works on the South Branch reversed the current, drew water from the lake and washed Chicago's sewage into the canal. To-day the city stands 25 feet above lake level. In 1901 the Drainage Canal was opened. One of the world's greatest sanitary works, it is 25 miles long, 15 miles of it cut through solid rock. The system not only disposes of the sewage and guards the water supply from pollution, but is to provide a ship-canal to connect the Great Lakes with the Mississippi—a glorified canoe-trail that follows the red man's route. Five tunnels that extend under the lake from two to four miles out give the city a *per capita* water-supply of 200 gallons a day. The death-rate has been lowered to 13.5 per thousand, the lowest of any great city in the world.

The lesson of wide streets and substantial buildings Chicago had to learn through the most disastrous fire recorded in history. In October of 1871 the city had a population of over 300,000, mostly housed in crowded wooden buildings that had been dried to tinder by a long drought. Starting on the west side of the river, a strong southwest wind hurled brands on bridges and shipping and so across the stream. The business section was wiped out east to the lake and south to Harrison Street. Crossing the main stream, the fire swept the northern division, the finest residence section, to the city-limits. Three and a third square miles were burned over, 17,450 buildings were destroyed, 100,000 people made homeless; and there was a money loss of $200,000,000. Within a year the city had sprung from its ashes and added 50,000 to its population. Its courage, energy and resource amazed an admiring world. In the middle 80's, under pressure of demand for more room in the business

CHICAGO PUBLIC LIBRARY BUILDING

section, the first of the steel-frame, fireproof sky-scrapers, known as the Chicago construction, was erected. The Masonic Temple, the Woman's Temple and the Auditorium are among the earliest of these tower-like structures now covering the greater part of the central business district. In contrast with these are the low, classic outlines of the Public Library, the Art Institute and several bank buildings. The improvement in domestic and church architecture dates from the World's Fair (1893) and the erection of the many, red-gabled, gray-stone buildings of the university quadrangle on the Midway. In this connection too much can scarcely be said for the influence and benefit of the parks, boulevards and uniformly broad avenues. Lincoln Park on the north shore, Humboldt, Garfield and Douglas Parks on the west side and Washington and Jackson in the

south division are connected with each other and with many smaller parks and open squares by boulevards. Michigan Avenue, Jackson Boulevard and the Lake Shore Drive link the limits with the business section. Extension of Grant Park a mile into the lake, and a shore line parkway, will give Chicago one of the most beautiful waterfronts in the world.

WHAT MADE THIS GIANT CITY

Business is on the same gigantic and aspiring scale as the sky-scrapers, "City Beautiful" plans and the growth in population, which is now approximately 2,500,000. The earliest lines of trade to be developed, when the western limit of commerce was the Mississippi, were grain and lumber. With the spanning of the river by rail and the development of the wheat states of the northwest, the Chicago Board of Trade ruled the grain market. The conquering of the Great American Desert confirmed her sovereignty. Annually the city receives over 35,726,000 bushels of wheat. Receipts of wheat, flour, corn, oats, rye and barley aggregate 332,008,041 bushels. The city has 68 elevator warehouses, with a grain-storage capacity of 46,640,000 bushels. The prairie country's greatest need was for building material. This Chicago supplied from the forests of Michigan and Wisconsin. With the partial exhaustion of these forests Chicago reached more remote supplies. The lumber handled in the Chicago market yearly exceeds 2,642,650,000 feet. The packing industry which began in the 40's, to supply lake-vessels and lumber-camps with salted and smoked meats, received its first impetus from the Civil War, and its second and greater one from the invention of refrigerator cars by which fresh carcasses may be shipped to any part of the world. Yearly the slaughtering and meat packing houses of Chicago turn out products amounting to over $375,000,000 and employ upwards of 27,000 men. The iron and steel industry, which has grown up since the discovery of iron ore in the Lake Superior region, amounts to $135,000,000 (including products of foundry and machine shops); printing and publishing $74,000,000; and the manufacture of clothing, which began in the outfitting of 49ers in the rush for the California gold-fields, turns $85,000,000 into Chicago's pockets every year.

OTHER FEATURES OF HER COMMERCIAL LIFE

The manufacture of electrical machinery alone now aggregates $20,000,000 a year. At the packing houses, the International Harvester works and the plant of the Western Electric Company visitors are welcome and the processes are explained. At the electric works the making of telephones and dynamos is especially interesting and of educational value. The average pay-roll of Chicago manufactories amounts annually to $175,000,000, and in the value of manufactured products Chicago ranks second in the list of American cities.

In the wholesale trade dry goods lead with $200,000,000, produce $160,000,000, groceries $100,000,000, boots and shoes $60,000,000 and the mail order business, which enters all lines, $90,000,000. Manufactured articles are carried chiefly by rail; raw material, such as coal, iron ore, grain and lumber, etc., as largely as possible by water in the six months' open season. Each year more than 6,000 vessels, with a tonnage of 9,470,572, clear in Chicago's two harbors.

PUBLIC OWNERSHIP AND PUBLIC SERVICE

The city owns and operates its waterworks and municipal electric lighting-plants, and has a partnership interest in, and the right to purchase, its street-railway surface-lines. The surface-mileage has trebled in ten years and is now 1,364 miles. The elevated mileage has doubled to 144 miles. The form of government is typical. The departments of police, fire, health, water, etc., are under separate heads, and the schools, library and park systems are managed by boards. The old corrupt system of police-court justice has been abolished and municipal courts established. For the child delinquents and defendants there is a juvenile court in its own building, one of the first in the world. To support the city government with its 191.39 square miles of territory and its 21,000 officials and employees, Chicago has an annual revenue of $52,177,591, on an actual valuation of real and personal property of $2,783,248,476.

More than half of Chicago's population is of foreign birth or parentage. With over 40 nationalities listed by the last census, the Germans lead with 416,000, Irish 215,000, Poles 109,000, Swedes 100,000, Bohemians 76,000, Norwegians 41,000, Italians 26,000.

EDUCATION AND THE ARTS

In many of the 407 school-buildings few of the pupils ever hear a word of English at home. There are 6,740 teachers and 307,281 pupils in the day-schools. In the night-schools are 25,000 more, chiefly foreigners. There are 21 high-schools, four of which are manual training, and a normal college. A down-town commercial college is to be established. The public library has 800,000 volumes for free circulation and reference, with many branch distributing stations. Of the endowed libraries, the Newberry covers history and music; the John Crerar library, science and mechanics; the Chicago Historical Society is the custodian of local history, relics and documents. The Art Institute, which has some notable collections, is free to the public three days in the week, and maintains an art-school.

A GREAT MUSICAL CENTER

In the Thomas Orchestra Hall, Chicago stands alone, among American cities, in the possession of an endowed home for orchestral music; and in the Field Columbian Museum of Natural History and Anthropology, endowed with $8,000,000 by the late Marshall Field, Chicago, has

a great scientific institution that must long eclipse anything of the kind in the world. Besides the University of Chicago, which ranks with the best in the country, Chicago has the Northwestern University at Evanston; Wheaton and Lake Forest Colleges; the Chicago, the Western and the McCormick Theological Seminary; the Armour Institute of Technology; Lewis Institute; Rush Medical College; the College of Dental Surgery; the School of Domestic Science; the Kindergarten College; and many other special schools for higher education. A marked feature of the city's educational and moral life is the many social settlements maintained by the universities and churches. Hull House, established about 20 years ago by Miss Jane Addams, was the pioneer settlement and is to-day the model upon which successful work of this kind is done everywhere in the United States.

There has been no history of Chicago of portable size published. [Kirkland's *Story of Chicago* is a portable history.] Visitors to the city should get a copy of the last annual edition of the *Daily News Almanac* to learn what to see and how to get there.

One of Chicago's great engineering enterprises is the forty-five mile subway connecting the business district with the railroad warehouses. It was begun in 1899 by the Illinois Tunnel Company, under an ordinance which required the overhead telegraph and telephone wires of the down-town or "loop" district to be carried underground. The company was reimbursed for its expenditure of $30,000,000 by permission to use the tunnel for freight-traffic. The roof of the subway lies 24 feet below the surface, beneath the water and gas and sewer mains, and the work of excavation was carried on with no interruption of traffic. In the space of a mile square under the business district, there are now 26 miles of tunnels which intersect at every second block. Connection was made with the six big freight-depots of 25 trunk lines and with the terminal station at Taylor Street and the river. The tunnels are of two sizes—trunk, 14 feet high, branch, seven feet six inches. All are lined with 21-inch cement walls poured on a framework of structural iron. The wires were carried along the walls, a narrow-gauge track was laid and trolley wires dropped from the roof. The cars are open steel-boxes, 12 feet long, of one and a half tons' capacity. In the freight-yards these cars are lifted through shafts, loaded, lowered and sent direct into the warehouses of merchants. If the goods are not required inmediately, they may be stored in one of seven big warehouses at the terminal station. There the cars are hoisted to the top by enormous elevators, and unloaded.

The trains make from 12 to 15 miles an hour and deliver up to 100,000 tons a day. Of coal alone 4,000,000 tons are delivered through the subway to the "loop" district in a year. The system relieves the congested down-town streets of thousands of horses and wagons. Chicago is the only city in the world with a subway system of freight-distribution. Plans are being worked out for a great subway system which is to be built either by the city or by private capital under municipal control. The general plan recommended by the subway commission appointed by the mayor is for a high level subway, as close as possible to the surface of the streets and to be operated by electricity. The estimated cost of the subways themselves is $96,257,000 and the cost of equipment $34,844,000.

Chickadee, a modest, little, soft-plumaged gray bird, is a member of the titmouse family. The black-capped chickadee is a permanent resident of the northern states. Its breeding-range is north of the Carolinas to Labrador. It is somewhat smaller than the English sparrow, the upper gray slightly tinged with brown, crown and throat black, with white separating the two blacks; underneath a dingy white. It is a brave little bird, quite unafraid of snow and storm, more common in lower New England in winter than in summer, through wintry weather blithely singing its *chicka-dee-dee-dee-dee* or uttering its high, sweet whistle; and a friendly, tame bird, readily responding to invitation to dine near our windows and doors. It is a valuable friend to man in many ways; as an insect-destroyer it is most diligent, a persistent enemy of the cankerworm moth, destroying both the female and eggs and thus keeping down the numbers of "measuring" or "inch" worms. It eats insects in summer, their eggs in winter. Hodge says that probably no bird possesses a higher economic value than the chickadee. The birds build their nests in holes—a deserted woodpecker's nest, or a knothole or a cavity made by themselves in some decayed tree. The nests are of moss, feathers, wool, plant-fibre, fur or sometimes wholly of short hairs. There are from five to eight eggs, white with sparse markings of purple or brown.

BLACK-CAPPED CHICKADEE

The Carolina chickadee is a southern species, the chief difference from the above being that the southern bird is smaller, its

breeding-range from southern Illinois southward. See Dugmore: *Bird Homes;* Chapman: *Bird Life;* Blanchan: *Bird Neighbors;* Hodge: *Nature Study and Life.*

Chickahominy (*chĭk'ȧ-hŏm'ĭ-nĭ*), a river in southeast Virginia, which flows into the James. Part of the region watered by the river was the scene of several battles in 1862 and 1864. Here the river flows through a wooded swamp, a few hundred yards wide. A continuous rainfall floods the swamp and overflows the neighboring bottom-lands. These are crossed by deep ditches, and even when not overflowed are so soft as to be impassable for cavalry and artillery. As a military obstacle, the narrow Chickahominy, with its bordering swamps, was found to be more formidable than a broad river. Here in 1862 were fought the battles of Williamsburg, Hanover Court-House, Seven Pines, Fair Oaks, Mechanicsville, Cold Harbor, Savage's Station, Frazier's Farm and Malvern Hill, and in 1864 the second battle of Cold Harbor was fought.

Chickamauga (*chĭk'ȧ-mą'gȧ*), **Battle of,** fought upon Chickamauga Creek, a branch of Tennessee River, between the Union Army of the Cumberland under General Rosecrans and the Confederates under General Bragg, Sept. 19 and 20, 1863. The main battle was opened on the morning of the 19th, the Confederates endeavoring to get possession of the road to Chattanooga. Neither side gained any advantage on the first day, though the fighting was severe. During the night Longstreet joined Bragg. On the 20th the Confederates renewed the attack with great fury. At length, in an effort to strengthen the left, which was hard pressed, and partly through a mistaken order, the Union center was fatally weakened. Longstreet with his veterans charged through the line and drove the right wing in confusion from the field. But Thomas, who was on the left, remained firm and repulsed charge after charge made against him by the whole Confederate army. During the night he withdrew to Rossville Gap. This was a Confederate victory, though of no great advantage to them, as it left Chattanooga, the objective point, in the hands of the Federals. The Union loss was about 16,000; Confederate loss about 18,000.

Chickasaw Bluffs (*chĭk'ȧ-są*), **Battle of,** was fought near Vicksburg, Miss., Dec. 29, 1862. General Sherman, who was besieging Vicksburg, endeavored to attack the city in the rear. He sent a strong force up Yazoo River, which was to land and march down from the north. In the line of the march was the Chickasaw bayou, bordered by a broad, miry swamp, almost impassable, and guarded by batteries and rifle-pits on the opposite bluffs. Though the head of the charging column reached the works, the heavy fire forced it back and the enterprise was abandoned. The Union loss was about 1,900, while the Confederate loss was very small.

Chickasaws, a tribe of Indians, found by the whites about 160 miles east of the Mississippi. De Soto visited them, but when he sought to force them to carry his baggage, they attacked him, causing great loss. In the French-and-Indian wars, the Chickasaws were between the English and the French settlements, and thus came into the struggle between the two nations. They uniformly sided with the English, stirring up the Natchez against the French, and, when that tribe was almost destroyed, joining them in their desperate raids. In 1793 they joined the whites in the war against the Creeks. At the beginning of the 19th century some of the tribes left for Arkansas in search of better hunting-grounds. In 1822 those left in Mississippi, numbering 3,625, settled in eight towns, owning slaves and selling cattle and hogs to the whites. In 1834 they sold their lands to the government and removed west of the Mississippi, buying lands of the Choctaws, who spoke the same language. In the Civil War they joined the south and lost many of their braves, besides, of course, losing their slaves. They no longer have a king, but have a governor, together with a senate and house of representatives. They own their land in common, but each man's stock is his own. They receive an annuity of $3,000, and have in the hands of the government $1,400,000 in bonds, of which they receive the interest.

Chickasha, a city, county-seat of Grady County, Oklahoma. It is the trading-center of a fine agricultural region and an important shipping-point for cotton. Chickasha has a flour-mill, a broom-factory and cotton-gins, and the Rock Island car-shops and round-house are located here. It has four banks, good public schools, a convent, library and several churches; also the service of two railroads. Population, 10,320.

Chic'opee, Mass., a thriving manufacturing town on the Connecticut River, at the mouth of the Chicopee, four miles north of Springfield, Hampden County, Mass. It possesses excellent water-power for its industrial establishments, which include the manufacture of cotton, knitted goods, knitting machines, bicycles, rifles, shotguns, pistols, mechanic's tools and agricultural implements. It has a number of good schools, churches and a convent, with several substantial banks. Chicopee Falls are in the neighborhood. Population, 30,000.

Chignecto Bay (*shig-nĕk-tō*), an inlet at the north end of the Bay of Fundy. It separates Nova Scotia from New Brunswick. It is 30 miles long by eight miles in breadth. There is an isthmus only 14 miles wide between it and Northumberland Strait in the Gulf of St. Lawrence.

Chi-hoang-ti, one of the greatest emperors of China, who ruled from 246 to 210 B. C. It was he who, by his military successes, formed the eight kingdoms then making up China into one great empire. He further extended the empire so that under him it came to be about as large as it is now. He was also the builder of the great Chinese wall.

Chihuahua (*chē-wä'wä*), the largest state of Mexico, adjoining New Mexico and Texas, covers 87,802 square miles and is about as large as Idaho. In the east is a large desert of sand; the south and west are mountainous; and there are many rivers. Its silver mines were for centuries the richest in Mexico. Its capital, Chihuahua, rises like an oasis in the desert among roses and orange-groves. Founded in 1691 it housed a hundred years ago 80,000 people. Population of the state, 405,265.

Child, Lydia Maria, American author and, with Wm. Lloyd Garrison, a zealous advocate of slavery abolition, was born at Medford, Mass., Feb. 11, 1802, and died at Wayland, Mass., Oct. 20, 1880. Early in the thirties, some few years after her marriage, she and her husband (David Lee Child) took an active interest in the subject of American slavery, against which she made many stirring appeals, both in her novels and in a periodical which she afterward edited, the *National Anti-Slavery Standard.* Her writings greatly contributed to the formation of public opinion adverse to the holding of slaves; while she aided the cause she had at heart by supporting schools for the negroes, helping freedmen and giving of her bounty to the Union soldiers in the Civil War. Her writings include *The Rebels;* a novel, *Hobomok; Fact and Fiction; The American Frugal Housewife; Looking Toward Sunset* and *The Progress of Religious Ideas.*

Child-Study. Early philosophers and psychologists, notably Plato and Aristotle, have occasionally commented on phases of child-life, but the systematic study of the mental and physical nature of children has been reserved for modern and, indeed, quite recent times. The subject was first approached from the point of view of the educator. Among many others Comenius, Rousseau and Pestalozzi were strenuous in insisting on the vital importance of a study of children to the one who expects to teach them. All these writers emphasized the need of beginning education with an appeal to the senses. Only in this way, they declare, can the reason and the judgment ultimately be reached. Rousseau, the enthusiastic advocate of nature, was especially interested in the child, at any rate in the theoretical child, as one expressing the purely natural in its naïve spontaneity. He would have the education of the child consist largely in permitting it to develop in a natural and untrammeled way. This idea, antagonistic to the earlier religious one of the total depravity of the child, was, in spite of some limitations, the inspiration of the greater part of modern educational reform.

Herbart, whose educational theory turns about the notion of apperception (q. v.), requires of a teacher a very careful study of the contents of the child's mind and also of those diseases, temperamental variations and emotions that are likely to interfere with successful learning. It will be noticed that he does not advocate child-study as a means of discovering those instincts, the proper development of which constitutes the aim of education. This point of view, suggested by Rousseau, it was left to Froebel and more recent students of children to develop. On the other hand, Herbart did point out the great importance of studying the minds of children and of men by observation and experiment instead of by introspection and speculation. This improvement in method has been responsible for a large part of the results of recent child-study.

Froebel derived is view of the aim and material of education from his sympathetic philosophy of the nature of the child. From the point of view of the development of child-study, his most interesting conception is that the child in his evolution passes through or recapitulates the same series of steps that has been traversed by the race in its evolution. This idea was not original with him but was derived on the one hand from philosophers like Lessing, who were emphasizing, as against Rousseau, the value of historic culture to the individual, and on the other from biologists like Von Baer, who had discovered that the embryo of any higher tvpe of animal passes through stages in which it resembles the embryos of lower types down to the very simplest. This notion of recapitulation has been applied to education in two forms. The first is that of the culture-epoch theory, developed by Ziller, one of the followers of Herbart. According to this view the course of study should be so arranged that the child will first take up the study of primitive life and culutre, and then deal successively with more and more advanced types of civilization. Courses of study arranged on this plan were expected to appeal most successfully to the interests and powers of the child. This contention has not been entirely justified, but the culture-epoch theory remains to-day a most valuable clue to the interests of children. The second application of the theory of recapitulation to education is found in the notion that the various instincts appear in the child in much the same order that they

appeared in the race. At first very imperfectly developed, they require education for their perfecting, but the satisfactory maturation of the child requires that each should be allowed to run its course, so that the properly developed child has run the gamut of ancestral interests. This idea may be said to represent fairly well the belief of the very influential group of child-psychologists who follow President G Stanley Hall of Clark University. Both applications of the idea of recapitulation to education are liable to the criticism that, while they suggest what is interesting and can be taught to the child, they do not enable us to know what should not be taught. Many stages of culture need not be represented in the child's education. So, too, many instincts, as those of fighting, may need repression rather than development

The method of careful scientific observation of the child recommended by Herbart finds its earliest and best exponent in the German physician and psychologist, Preyer. In his book, *The Soul of the Child*, we find a most careful study of the development of the powers of sense, of the feelings of physical and mental control, of language and the logical processes and self-consciousness. Space does not permit the statement of detailed conclusions, but the most suggestive and interesting outcome of Preyer's investigation is the clearness with which he puts the fact that the child at birth and for many months thereafter is not only without self-consciousness, reason and will, but that even its sense-perceptions are vague, confused and undifferentiated. Feeling is at first the mere rude sense of discomfort or comfort. The eyes are uncoördinated, the gaze is not fixed, and objects are not clearly discerned, not to speak of distances and colors. The same general condition holds of hearing and touch and even taste and smell.

The clarifying discoveries of Preyer have stimulated much valuable research into the methods by which self-control, judgment and conscience are evolved from the primitive chaos and night of the infant's consciousness. The most important development in this field takes the form of a psychological reinterpretation of the old principle that learning should be by doing. As stated by the American psychologists, Professors Dewey and Angell, who merely represent here the point of view of the psychology of to-day, consciousness arises when the child is stimulated more or less uncomfortably by some object, say a rattle. It reacts in a variety of movements, partly reflex, partly random in character. Among these movements one is usually more satisfactory in its results than the rest. Assumie t to be that of grasping the rattle. This comes in the course of time to be the one movement that follows from the given stimulus, and the other unsuccessful movements are gradually eliminated. While this process is going on, the mind is gradually growing familiar with the stimulating object and is distinguishing those characteristics by which it can be identified. Thus perception is developing. The child becomes conscious of what the object is and what it means. It then is capable of acting toward this object with intelligent foresight into consequences, that is, it can will In a similar way all the mental powers develop. We learn to perceive, to remember, to imagine and to reason because we react toward stimulating objects, and in order that we may react more successfully Consciousness finds its stimulus in an unsatisfactory situation and its function in assisting to a satisfactory treatment of this To get a pupil to learn, the teacher must get him to be discontented with his capacity to do. This will stir up a process of experimentation, in the course of which the powers of thought and feeling will expand

The typical experimental activity through which a young child learns most has been recognized to be that of play. According to Professor Groos, play is simply the expression of the instincts of the child and so of its interests and capacities. This activity is accordingly justified in the place assigned to it in education by Froebel. It must, however, be led into work by methods that are indicated in the article on INTEREST. One important activity by which this transition between the imperfect, instinctive plays of the child and mature efficiency is effected is found in imitation. This process has been exhaustively treated by the American psychologist, Professor Baldwin, who finds in it the means by which the child is led to become conscious of himself and of others, and so to develop his social and ethical nature. In the endeavor to imitate the child becomes adjusted to society.

The great emphasis thrown by child-psychologists upon the feebleness of intelligence and the imperfection of instincts in the infant naturally rouses our curiosity as to why the young of brutes should be so much more capable of helping themselves. Mr. Fiske, the American historian and philosopher, has found in the helplessness of infancy the secret of man's capacity to learn. A brute is fairly well-fixed in its mode of life by its instincts. It does well in commonplace situations, but in unusual emergencies it is helpless. Its life is, however, as a rule, simple and commonplace It does not need to do new things. Man, on the other hand, is in his complex life continually compelled to learn, to readjust himself. Hence he is born helpless, with imperfect instincts

and a corresponding enormous capacity to learn.

In recent years the child-psychologists have devoted much attention to the special features of the age of adolescence. This subject is treated in another article. Another important field is the study of the physical development and health of the child. Much information of the greatest value to teachers has come from these investigations.

See APPERCEPTION, INTEREST, ADOLESCENCE, METHOD OF TEACHING, MODERN EDUCATION, PSYCHOLOGY FOR TEACHERS, SELF-ACTIVITY.

Consult Preyer: *The Senses and the Will* and *The Development of the Intellect*, Appleton & Co.; Kirkpatrick: *Fundamentals of Child Study*, the Macmillan Co.

E. N. HENDERSON.

Child-Labor Laws. So long as a young apprentice lived in the family of his master, the evils of child-labor do not appear to have been great. But when, at the end of the eighteenth century and the early part of the nineteenth century, children came to be employed in large factories, at a very early age, for very long hours and under a brutal discipline and most unhealthy conditions of work, laws became needful to restrict the abuse of child-labor. Both the need and the laws came earlier in England than in the United States. Probably no man did so much on behalf of the factory-acts as did Lord Shaftesbury. In 1802 the hours of apprentices were limited to twelve, no part of which must fall between 9 P. M. and 6 A. M. In 1819 was passed an act that no children under nine years should be employed in the cotton-mills nor should their hours be more than twelve per day. In 1831 night-work in cotton-factories was prohibited for persons between the ages of nine and twenty-one years. In 1833 night-work for young persons was prohibited in most other mills. In 1847 came the ten-hours bill, which limited the work of women and children to ten hours per day. In 1899 the Elementary Education Act raised the age at which a child might leave school from eleven to twelve years. An act of 1901 summed up the results of the factory-acts and allowed no children under the age of twelve to be employed in factories.

Until recently in the United States, each state made its own labor laws, and as a result a few backward states had no child-labor or even compulsory education law.

The most important legislation in the history of child-labor was the act passed by Congress in 1916, excluding from interstate commerce, articles from factories where any child under fourteen years of age is employed or where any child under fifteen has worked more than eight hours a day or been employed at night. In 1918, however, the Supreme Court—although by a majority of only one—declared the law unconstitutional on the ground that the regulation of child labor is a purely internal affair of the state and therefore not within the jurisdiction of Congress.

Childs, George William, an American publisher, well-known for his generous gifts to charitable and public causes. He was born at Baltimore, Md., in 1829. He came to Philadelphia at an early age, and about the year 1849 became a member of a publishing firm afterward known as Childs & Peterson. In 1864 he became owner of the *Public Ledger*, which he made a great success. His philanthropy took many and varied forms, at one time establishing a home for aged printers; at another commemorating authors, like Geo. Herbert and Wm. Cowper in Westminster Abbey and erecting to Shakespeare's honor a memorial fountain at Stratford-on-Avon. He died at Philadelphia, Feb. 3, 1894.

Chile (*chil'e*), a republic of South America, has been called the shoestring republic from its peculiar shape. It is a narrow strip of territory thirty times as long as it is wide. It is nearly 3,000 miles long with an average width of less than 90 miles. For comparison conceive a strip of territory as wide as from Chicago to Milwaukee and as long as from New York to San Francisco. It stretches from Peru on the north to the extreme southern limit of the continent, with Bolivia and the Argentine Republic on the east and the Pacific Ocean on the west.

Surface and Climate. Chile has an area of 292,580 square miles, about five times the area of New England, with a population of 3,329,036, largely in the agricultural provinces north of the desert regions. Chile is a mountainous country, carrying two parallel ranges through most of its length. A narrow strip along the coast slopes up to the western Cordilleras. Between this range and the great Andean range, which forms the eastern wall of Chile, lies the great central valley, with a length of 581 miles and an average width of 31 miles. This valley has a rich, productive soil and contains the most important cities and towns. More than one fourth of the territory of Chile lies above the snow-line. In the western Cordilleras range are found the snow-capped peaks of Tacora 19,800 feet; Huallatire 19,720 feet; Parinacota 20,950 feet; In the main Andean range are Copiapo, a volcano, 20,022 feet; Nevada Los Leones, 19,850 feet; Cerro Jotabeche, 19,259 feet; Cerro Volcan, 18,341 feet; and on the boundary between Chile and Argentina, Tres Cruces 22,213 feet; Cerro Incahuasi 21,576 feet; Los Patos 20,595 feet; and many others from 18,000 to 20,000 feet high. A number of islands belong to Chile, the most important being Chiloe, Juan Fernandez and a part of Tierra del Fuego.

Climate. The seacoast on the west and the mountain range on the east afford conditions which render the climate of Chile healthful. The temperature varies from 67° in the north to 43° in the south. It averages about 6° lower than on the eastern coast of South America, owing to the Antarctic current, which flows along the western coast, and to the Andes which shut off the warm winds from the eastern plains. The northern section is tropical, and, being subject to the dry southeast trade-winds, is practically rainless. The central division has a temperate climate and a rainfall during the winter, with dry summers. In the southern section the rainfall is heavy, averaging 115 inches annually.

The rivers of Chile, of which there are a large number, have their rise in the Andes and empty into the Pacific, and for the most part are short shallow streams.

Cities. Santiago, the capital of Chile, is the third largest city in South America, population, 332,724. Valparaiso, the chief port on the western coast of South America, is 62 miles west of Santiago, population 162,447. Iquique, celebrated as a nitrate port, has a population of 42,488. Other cities are Concepcion, population 55,330; Talco, population 38,040; Chillan, population 33,506; La Serena, population 15,996; Curico, population 17,573; Antofogasta, population 32,496; Talcahuano, port of the city of Concepcion, population 15,561.

Resources. It is a noteworthy fact that the barren, rainless section in the north of Chile is the chief source of the nation's wealth. The export of nitrate from this region amounts to over $43,000,000 annually, being more than two-thirds of the total exports of the country. Of nitrate 5,000,000 tons are produced annually. Other mineral products, copper, silver, gold, iodine, with leather, wool, hides, etc., bring the total exports up to $125,000,000. Agricultural products, while large in the aggregate, are not sufficient for the needs of the country, so that imports of food amount to six millions annually.

Railways. There are 3,573 miles of railway now open for traffic. The Central system, a trunk line owned by the government, traverses the central valley with branches to coastal and interior points. A branch connects with the Transandine Railway, completed in 1910, which furnishes all-rail connection with the Atlantic coast at Buenos Ayres, a distance of 880 miles from Valparaiso.

Government. Chile is a republic, consisting of twenty-three provinces and one territory. The president is elected for a term of five years and is not eligible for a second term. He is assisted by a council of state composed of eleven members, six of whom are elected by Congress and five are appointed by the president. There also is a cabinet of six ministers who are appointed by the president, with the approval of the senate. There is a national congress consisting of a senate and a chamber of deputies. The chief executive of each province is an intendant appointed by the president

Education. A system of public schools is maintained by the state. There are over 2,700 public primary schools with 258,875 pupils, beside 506 private primary schools with an attendance of 66,577. There are two universities, one belonging to the state, with an attendance of about 3,000. There are lyceums and colleges in the capitals and provinces, including four for girls in Santiago and 11 in other towns, with 2,500 students. There are three normal schools for men and three for women, with an aggregate attendance of 2,222. There also are schools of mining, private secondary schools, agricultural and other special schools.

History. The northern part of Chile belonged to the Incas of Peru; the southern part to the Araucanian Indians, the only tribe unconquered by the Spaniards, and who, until lately, kept themselves independent of Chile. The first European to land in the country was the Portuguese discoverer, Magellan. He reached Chile in 1520, just after his famous voyage through the strait that bears his name. Pizarro's lieutenant, Almagro, headed an expedition southward from Peru in 1535, and another expedition, under Valdivia, founded Santiago in 1542. Chile declared herself a republic in 1810 and revolted from Spain, under the leadership of Don Bernardo O'Higgins, her first dictator. The constitution was adopted in 1833.

Chile's war against Peru and Bolivia arose over boundary-disputes with Bolivia. No sooner was war declared against Bolivia, in February, 1879, than Peru avowed a secret treaty, offensive and defensive, made six years before, between herself and Bolivia; and as a result, she bore the brunt of the war. Chile overwhelmingly defeated the allies. In the battle of Iquique, May 21, one of Peru's four ironclads was sunk on the rocks; and at the battle of Cape Augamos the capture of the ram *Huascar* left Chile master of the sea. The invasion of Peru followed, 10,000 Chileans routing 20,000 allied troops at Dolores, November 2. The doubtful battle of Tarapaca, a week later, was followed by a retreat of the Peruvians. Early in 1880, 14,000 Chileans won a third battle, north of Tacna, after a hard march across the desert and still harder fighting. At last, after two well-fought battles, at Chorrillos and Miraflores, the Chilean army of invasion entered Lima, Jan. 18, 1881. The little republic has since passed through a revolution, brought about by the unlawful use of power by the president or, rather, dictator, Balmaceda. The law-abiding party or congressionalists were successful, Balmaceda committing suicide after all hope was lost. In 1891 an at-

tack upon American sailors in the streets of Valparaiso came near to bringing on a war with the United States.

Chil'lico'the, O., an attractive city and railroad center, the capital of Ross County, Ohio, situated on the Scioto River, 50 miles south of Columbus and 100 miles east of Cincinnati. The B. & O. S. W., Norfolk & Western, C., H. & D. and Scioto Valley railroads traverse the town. At the beginning of the last century, it for a decade was the capital of Ohio. It possesses some fine public buildings, including schools, courthouse and public library. Its manufactories include paper mills, flour mills and the manufacture of carriages, shoes and farm implements. Population, 15,500.

Chil'koot Pass. This pass is in eastern Alaska, on the trail leading from Lynn Inlet and the ports of Dyer and Skagway, to the gold fields of the Klondike and other interior points. It starts in Alaska, but the highest point is just over the Canadian border; and here the British have their custom-house. There is a cable which pulls up the loads of the intending miners at this point. The varied types of humanity and the presence of a custom-house in this wild spot amid the snows give this port a picturesque character of which many have written.

Chimborazo (*chĭm'bō-rä'zō*), a peak of the Andes, in shape like a cone, lying in the republic of Ecuador, 20,517 feet above the sea. It was for a long time thought to be the highest mountain-peak in the world, and its snowclad top was named the Silver Bell. The mountain was first scaled by Whymper in 1880.

Chimera (*kĭ-mē'rà*). A chimera is a monstrous or vain fancy. The chimera of mythology was a monster, its front like to a lion, behind a serpent, and in the midst of it a goat. This fire-breathing monster was slain by Bellerophon. It is thought to have stood for a volcano, on whose crags were lions and on its rocky sides goats; while at its foot would dwell the serpents of the marshes. Bellerophon, then, would have subdued it by making his home upon its forbidding slopes. Hesiod gave the chimera the heads of a serpent, a lion and a goat. There is a family of shark-like fishes now known to scientists as *Chimæra*.

Chimney-Swift, mistakenly called chimney-swallow, is not even distantly related to the swallow, its stiff, mechanical flight being wholly different from that bird's graceful motion. If not characterized by grace, the flight is very swift and is long sustained, and the bird is well-named the swift. It is said it can travel 1,000 miles in twenty-four hours, stopping only to roost in occasional tree or hollow chimney. The bird does not perch, but clings to a rough surface by means of sharp claws and sharper tail. Its nest, built in an unused chimney, seems more like a shelf than a nest. It is almost flat, and is woven entirely of sticks fastened to the wall by a sort of glue that flows from the mouth during the breeding season. This glue becomes hard and very strong, and the nests are fastened most securely, though, as is well known, a sudden fire in the chimney brings disaster. The four to six eggs are white. With beak and feet the bird, while in flight, breaks off sticks for the nest, and while in flight feeds, going through the air with mouth wide agape—as do its kin, the nighthawk and whippoorwill, and as does the swallow. Swifts rid the air of gnats and mosquitoes; they travel in the late afternoon and early morning. In color they are a sooty gray. The birds breed from Florida to Labrador and west to the Great Plains, are common summer residents and migrate in April, September and October. See Dugmore: *Bird Homes;* Blanchan: *Birds Every Child Should Know.*

Chimpanzee (*chĭm-pan'zē*), the best known of the man-like apes, because often seen in captivity, while its nearest relative, the gorilla, is practically unknown outside its natural haunts. It is also related to the orang-outang. It lives in the dense forests of Africa, on the coast of Guinea and in the heart of the continent as far north as the Sudan. It is of black color, with a broad, leathery, reddish-brown face, and attains a height of four or even five feet. It has no tail, and its arms, although long, are not so long in proportion to its body as those of the orang-outang. Its life is largely spent in the trees; when on the ground it often stands upright, and in walking places the knuckles of its hands on the ground, but the legs are bent and there is a forward stoop, so that the chimpanzee does not show its full height when walking. The chimpanzees, like other apes and monkeys, are great imitators, and show considerable intelligence and judgment. In their forest home they feed on berries and other fruits; cultivated bananas are also stolen, and on this account they are hunted by the natives. See APES.

CHIMPANZEE

China Sea, The, is chiefly known to American boys as the scene of terrible adventures with Chinese and Malay pirates and of the destructive work of typhoons. It is destined, however, to be one of the most important seas in the world. It is enclosed by the Malay Peninsula (British), French China and China proper to the west; to the north by the

Straits of Formosa; to the east by Formosa (Japan), the Philippine Islands and Borneo (British); to the south by the Java Sea. Hence it is girt by British, French, Chinese, Japanese and American dominions, countries that will no doubt develop into centers of civilization and wealth in days soon to come. East China Sea lies to the north of Formosa, being partly shut off from the Pacific by the Liu-Kiu Islands, a possession of Japan.

China-Ware, a species of fine porcelain, originally manufactured in China (whence its name). It is characterized by the fineness of its texture, transparency and beautiful color. It is made from two kinds of earth, known as petunse and kaolin, which are worked into a white paste, the kaolin enabling it to withstand great heat in the furnace; after this the article, cup, vase or whatever it may be, passes into the hands of the painters for decoration and delicate coloring, when it is then glazed or varnished, and once more submitted to the furnace to have the colors burned in and given their rich luster. China-ware has been manufactured more or less successfully in Europe. The fi est imitations are those known as Sèvres, Dresden and Wedgwood or queensware. The French have turned out some beautiful china, which they call *faïence fine*, or Henri II ware; but the most artistic, probably, is Sèvres, manufactured in that town, in France, together with the Dresden ware manufactured in Saxony. The most notable English ware turned out has been that of Josiah Wedgwood, whose classical vases, ornamented by the sculptor Flaxman, attained great repute and command high prices. The Japanese have also reached great perfection in the manufacture of porcelain; the Hizen or "old Japan" ware being noted for its elegance and beauty of color.

Chinch-Bug, an insect very destructive, especially to corn and wheat. It is estimated that the loss from this pest—mainly in the Mississippi valley—has amounted to $60,000,000 in a single year. It is a true bug—having a sharp beak, instead of jaws, with which it punctures the grain and sucks the juices. The plants are not eaten but sapped of their life. The chinch-bug is a small bug about one sixth of an inch long, blackish in color, with snowy white wing-covers marked with a dark spot and line.

China. Its boundaries now embrace China Proper, Manchuria, Ili (including Sungaria and East Turkestan) and Tibet, and also a wide territory in eastern Asia. According to recent Chinese estimates the following is the area and population of the republic: China Proper, 1,532,420 English square miles; population, 433,553,030. In 1904, however, Mr. Rockhill, American minister to China, after careful inquiry concluded that all official estimates since 1750 have far exceeded the truth and that probably the inhabitants of China Proper number less than 270,000,000. The dependencies are Manchuria, area 363,610 English square miles and the population 16,000,000; Tibet, area 463,200 English square miles and 6,500,000 population; and Chinese Turkestan containing 550,340 English square miles and 1,200,000 population. Mongolia, part of which is now independent, has an area of 367,600 miles, population, 2,600,000. The natives call their country the Flowery Kingdom or the Middle Kingdom, while the name Cathay came from the Persians. The name China comes from India.

Surface and Drainage. China Proper slopes from the mountainous regions of Tibet and Nepal toward the eastern and southern shores of the Pacific. The Nang Ling or Southern Range, a spur of the Himalayas, is the most extensive mountain range, separating southeastern China from the rest of the country. North of this long range, as far as the Great Wall, lies the Great Plain, covering 210,000 square miles, on which live 175,000,000 people. The soil of most of it, called loess beds, is a brownish earth, crumbling easily between the fingers. It covers the subsoil to a great depth, and is apt to split into clefts. These clefts afford homes for multitudes of the people, who live in caves dug at the bottom of the cliffs. Sometimes whole villages are so formed, in terraces of earth which rise one above the other. These loess beds are very rich, and have given to the province of Shan-hsi the name of the Granary of the Nation. The two largest rivers are the Ho or Yellow River and the Yang-tze-Chiang, each over 3,000 miles long. Ho has changed its course many times, and its numberless floods have given it the name of China's sorrow. It last burst its banks in 1887, destroying millions of lives. The Grand Canal, built by King Kublai, joins the northern and southern parts of the empire and is over 600 miles long. The Great Wall (see adjoining article) is 1,500 miles long.

Cities. The nominal capital is Pekin, in the province of Chili, population estimated at 700,000, part of which reside in the Chinese city and part without in the Tartar city. The other chief cities, with their estimated populations, are Canton (1,250,000), Tientsin (750,000), Shanghai (651,000), Hankau (870,000), Ningpo (400,000) Fuchau (624,000), Nankin (270,000) and Chung-King (620,000). Hong-Kong (population, 366,145) is a crown-colony of Great Britain, ceded to that power in 1841.

Resources and Exports. China's coal-fields are extensive, coal being found in all of the 18 provinces, but chiefly so far in Shansi, Feng-tse, Kai-Ping, Pashan, Annan and Kansu. Tin, copper, lead, silver and gold are found, but very little has been done in the way of mining. China's annual imports are in value about $310,000,000, while her exports reach $155,000,000. Silk,

raw and manufactured, raw cotton and tea, were among the chief exports. The annual value of Chinese exports to the United States exceeds $31,000,000, while the imports from the United States amount to nearly $17,000,000.

Agriculture. China is a farming country. Each year the emperor began the season by himself turning over a few furrows in the Sacred Field, while the empress in the same way started the work among the silkworms, the care of which is left to the women. Wheat, corn and other grains, peaches, pineapples and other fruits, sugar in Formosa, rice, and opium are grown; but tea and silk are the great export crops. Pork is largely eaten, though ducks and geese, fish, caught by tame cormorants (which see), and dogs are also used as food. The famous bird's-nest soup is made by slicing the nest into soup, thus adding an invigorating quality. The great beverage is tea, which is drunk weak and clear, and is offered to guests at all hours of the day. It is this tea-drinking habit which has made the Chinese a temperate people, a drunken man being a rare sight. The Chinese clothing is made from their stores of silk, cotton and linen. China is the home of silk; the mulberry grows everywhere, and the silkworm has been cared for since the 23d century B. C. The manufactured silk ranks as high as any made in Europe, while the embroidery is superior to that of the west. Cotton is also now raised everywhere.

Customs and People. For building, the Chinese use timber, brick and stone; but cheap houses are made of a kind of concrete called sifted earth. The best architecture of the country is seen in the marble bridges and altars of Pekin. In the country, houses are rarely over one story high. In the cities, the highest buildings are the pawnbroker's shops, and the most finely finished are the guildhalls of the trades. The pavilions and pagodas are picturesque. The streets of the cities are usually not wider than lanes; they are paved with slabs and are badly drained. Matting on the floor, tables and straight-backed chairs, sometimes a bamboo couch and stools, make up the furniture of the houses. The dress of both sexes is much the same. The most striking thing in the appearance of the men is the queue, a plat of hair which hangs pendant from the crown, all the rest of the head being shaved; while among the women the most notable thing is their small feet. This is a late and foolish fashion, prevalent only from the 6th century A. D., and is not customary among the very poor or among servants. It is effected by bandaging the feet in early years so as to prevent further growth. The Chinese girl at ten years is shut up in the women's apartments, and is taught the care of cocoons, silk weaving and all woman's work. At 15 she wears the hairpin to show that she is now a woman. Marriage is controlled by the parents, and a class of match-makers or go-betweens has arisen, who hunt up desirable matches for parents. The killing of girl-babies was formerly practiced; but only among the lower classes, and then the reason was poverty. The complexion of the Chinese is yellowish, the hair coarse black, the eyes seemingly oblique, cheek bones high and face roundish. They usually are stout and muscular, temperate, industrious, cheerful and easily contented. The dead are buried in graves built in the form of mounds or cones. There is no weekly day of worship and rest, like our Sunday, but festivals are many. New Year's Day is the one holiday for all. On this festival the noise of firecrackers is to be heard everywhere; the people dress in their best; the temples are visited; and the gambling tables are surrounded by crowds. Other festivals are those of Lanterns, Tombs, Dragon-Boats and All Souls.

History. The Chinese are a very ancient race, their annals going back to 2637 B. C., though there probably were Chinese living in the country long before that. China as an empire dated from 221 B. C., and lasted for over 2,100 years. The late dynasty, the Manchu-Tartar, began to reign in 1643. The Chinese were not the first people in China. They made their way from the north and west, pushing before them the older inhabitants. However far back you go, you always find two persons of prominence in China—the ruler and the sage. The sage, or Man of Intelligence, advised and helped the ruler, and taught the people lessons of truth and duty. From this grew up the custom, in full force since the 7th century A. D., that all officers of the government must be educated. This is now done by competitive examinations. The three religions of China are Confucianism, representing the brains and morality of the nation; Taoism, its superstitions; and Buddhism, its worship and idolatry, though it acknowledges no God. China, before the republic, was governed by the emperor through the grand cabinet, which met daily for business between 4 and 6 A.M. Seven boards—civil office, revenues, ceremonies, war, punishment, works and foreign affairs—prepared the matters which were to be dealt with by the grand cabinet. The provinces were governed usually by a viceroy acting for the emperor. The rank of the different provincial officers was indicated by a knob or button on the top of their caps. The revenue of the empire was under $100,000,000. The imperial army was about 200,000 strong, with headquarters at Pekin, and scattered in garrisons throughout the provinces as far as Turkestan. There were also some 700,000 militia troops, called the

national army. The navy after the war with Japan did not number more than a few small cruisers and several old torpedo-boats. China has never cared to have anything to do with western nations, but has been forced to do so. In 1516 the Portuguese, followed by the Spaniards, the Dutch and the English, appeared at Canton. In 1767 sprang up the opium-traffic. It was the traffic in this drug that brought on the war with England in 1840 and the war with England and France in 1855-57. By these wars China was forced to cede the island of Hong-Kong to Great Britain, to open many of its ports to trade and to let in missionaries and admit opium. It has recently been semi-officially announced that the importation of opium will after the lapse of a few years be prohibited.

On Feb. 24, 1844, Caleb Cushing arrived in China and negotiated the first treaty between that country and the United States. The late emperor came to the throne as a child of four years old. He became king in his own name in 1887; though in 1898 an imperial edict announced that the empress-dowager would direct the affairs of the empire. Of late years the Chinese have shown a tendency to seek a livelihood abroad, especially in California, British Columbia, the Straits Settlements, the East Indies and Australia. Chinese workmen or coolies began to come to the United States about the time of the discovery of gold. In 1882, 33,614 came. The low wages at which the coolie was willing to work threatened to destroy the high wages of American laborers; and this led to action by Congress prohibiting their immigration to the United States, although permitting Chinese merchants and students to travel or live in the country. British Columbia and some of the Australian colonies have also passed similar exclusion-laws. In 1894 China became involved in war with Japan, the result of rival interests in Korea. She, however, proved no match for Japan on land or sea. Her armies were routed and her fleet destroyed, and in 1895 she secured peace by the payment of a heavy war-indemnity and the cession to Japan of the island of Formosa. Of 34 ports open to foreign trade, only 7 have less than 20,000 population.

The very symbol of the "unchanging East" in her intense conservatism and apparent indifference to the movements of the world beyond her boundaries, her own easy and swift defeat by Japan and the subsequent victory of Japan over Russia produced a profound change in China and the mental attitude of the Chinese people. It convinced the leaders of national thought of the utter incompetence and corruption of their Manchu rulers and of the superiority of Western education, military and industrial methods and ideals. The more intelligent among the Chinese began, through t leaders, to demand better government, t right to take part in it, the increase and modernization of the army, the substitution of European for Confucian subjects in the Civil Service examinations and the establishment of schools similar to those of America and Europe.

Alarmed by these rumblings of the gathering storm, the government began the usual process of making pretended concessions. Late in August, 1908, an imperial decree announced that nine years from date—that time being required to fit the people for the proposed measure of self-government—a parliament and constitution would be granted. This failing to quiet popular discontent, another edict, three years later, provided for a cabinet and council to assist the emperor, but a president under the control of the throne was given the right of veto over other members. Exasperated by the delay in establishing real constitutional government, the people rose in various parts of the empire until the uprising assumed the form of a general rebellion and within a few months had become a revolution. Beginning in September, 1911, it was practically ended by December, and on December 29 Dr. Sun-Yat-Sen, who was educated in America and who had been particularly active in the campaign, was elected president of the "Provisional Government of the United Provinces of China." The child emperor, Pu-Yi, through the regent, abdicated, and on February 12 issued a proclamation which closed the 267 years reign of the Manchus and established the Chinese republic. The premier of the empire, Yuan-Shih-Kai (*Yŏŏ-än' shē ki'*), was chosen president. Dissensions, particularly over the finances, arose between the new president and the council and Yuan-Shih-Kai made himself emperor. He died shortly after and Si-Yuan-Hung, the former vice-president, became president. In 1917, the element who favored the old order of things made an attempt, under the leadership of Chang Hsun, known as "the bully of China," to reestablish the Empire, but were quickly crushed.

William J. Calhoun, our minister to China during her revolution, says: "The Chinese republic is, of course, not up to our standards, but that cannot be expected. The great mass are ignorant, living in mud-walled houses without windows or doors, but they are a peace-loving, industrious people and the whole impulse of China is toward modern education. In this the missionaries are doing a wonderful work."

Chinese Wall, The. The construction of this great feature of the Middle Kingdom was finished in 214 B. C., as a grand barrier along the north of the Chinese empire. It is 1,500 miles long, and is constructed of two strong retaining walls of brick, rising from granite foundations,

the space between being filled with stones and earth. It is about 25 feet broad at the bottom and 15 feet at the top, and from 15 to 30 feet in height. The top was at first covered with bricks, but is now overgrown with grass. The wall took ten years to build, and it is said that several millions of workmen were employed on its construction.

Chinooks (*chĭ'nookz'*), a tribe of Indians who formerly lived on both banks of the Columbia River, broken into many bands. Their language differed somewhat among different bands, and was hard to pronounce. This led the traders to use what was called Chinook jargon, containing some Chinook words, togther with French, English and words from other Indian languages. There are only a handful of Chinooks left, who are on the Chehalis reservation in Washington.

Chipmunk, a very wide-awake, sun-loving small squirrel that lives on the ground. It is sometimes called the striped squirrel, the black and light-colored stripes on its gray-brown fur being very prominent; a narrow black stripe on the middle of the back, on each side two black stripes separated by a stripe of light buff. It has roomy cheek-pouches in which it carries surprising quantities of nuts and grain to its nest. When hard beset, it will climb a tree for a short distance; but as it here is an easy prey for its enemies, it shows decided preference for a less exposed re-

CHIPMUNK

treat. Its worst enemies are the birds of prey and the mink, fox and weasel, the last following it into farthest recesses of its burrow. In time of peace chipmunks chirrup together most sociably, and out in the light and air of which they are so fond hold very animated conversations, their chorus sometimes almost a song. The burrow is kept most artfully concealed; no track leading to it. First a perpendicular tunnel is sunk down several feet, next a horizontal passage made for a few yards, then a slight ascent brings to the chamber which is carpeted with grass. From the chamber the ground surface may be reached by a second route, this opening a considerable distance from the first. In the cosy nest well below the frost-line quantities of nuts and grain are stored for winter use, supplies being carried in the cheek-pouches. In the west they work considerable damage and are regarded as nuisances. In addition to nuts and grain, they eat considerable fruit, and are very fond of berries. They are distributed generally in this country, several species being found here. The chipmunk somewhat resembles the little creature popularly called striped gopher, but should not be confused with it. See Hornaday: *American Natural History;* Stone and Cram: *American Animals.*

Chip'pewa Falls, Wis., a city, the seat of Chippewa County, on the Chippewa River and served by four railroads, 132 miles south-southeast of Duluth, Minn., and about 100 miles east of St. Paul. The State Home for the Feeble Minded and the County Insane Asylum are located here, while in the vicinity is the battle-ground (Tone Rock) of a Sioux-Ojibwa conflict. Besides its large lumber interests, the city manufactures wooden ware, shoes, gloves, woolen goods, foundry products and flour. It has some fine public buildings, including churches, schools, court-house and public library, McDonell Memorial High School and the Hanna M. Rutledge Home for the Aged. The population, of Chippewa Falls is now 8,893.

Chip'pewa Indians. See OJIBWAYS.

Chiv'alry. See KNIGHTHOOD and FEUDAL SYSTEM.

Chlorine, one of the elements, a gas of pale yellow color about two and one half times as heavy as air. It has a powerful odor and is very irritating when present even in very small quantities in the air that is breathed. It is an effective bleaching and antiseptic agent which is usually obtained from chloride of lime, also called bleaching powder, by exposing it to the air or especially by mixing it with an acid. Chlorine is one of the constituents of common salt or sodium chloride. United with hydrogen it forms hydrochloric or muriatic acid, and it occurs in many other substances, such as chloroform, chloral, potassium chlorate, etc.

Chlorophyceæ (*klō'rō-fĭs'ē-ē*), plants known as the green algæ, which are abundant everywhere in fresh waters and in damp places, and are of special interest in connection with the evolution of the higher plants. Some of the forms are one-celled, occurring in masses which cover damp tree-trunks, stones, etc., and look like a green stain; others have filamentous bodies, composed of a row of cells more or less elongated; while in other cases filaments become branched. It may be said in general that the filamentous body is the usual type among green algæ. These filamentous bodies may be seen forming felt-like masses in damp places or floating as green thready scum upon the water. Various reproductive methods are developed among the green algæ. The majority of them have the characteristic asexual spores,

which are variously ciliated, and have the power of swimming, being known variously as the zoospores, swarm-spores, swimming spores, etc. Most of the forms also have sexual reproduction, producing a fertilized egg. Some of the forms are free-swimming; while most of them have means of anchoring themselves to firm supports. The main groups are as follows: Protococcus forms, which are one-celled and reproduce mostly by cell-division; Conferva forms, which are filamentous and produce swarm-spores as well as sexual spores; Siphon forms, as in the common green felt; and Conjugate forms, of which Spirogyra, the pond-scum is the best known. The last are called Conjugate forms because in the sexual process two filaments put out tubes toward one another, which meet and form a passageway, and through these improvised tubes the sex-cells pass. The name refers to this yoking together. It is from the green algæ that the higher plants are supposed to have come. JOHN M. COULTER.

Chlorophyll (*klō'rō-fĭl*), the green coloring matter of plants. It is found associated with protoplasm, usually in special bodies called chloroplasts or chlorophyll bodies, which are found only in cells near the surface of parts exposed to light, *e. g.*, in leaves and twigs. These are usually rounded granules much too small to be seen with the naked eye (see Fig. I). In some algæ they are much larger, and have curious shapes. Little is known with certainty of the chemical nature of chlorophyll, because it easily decomposes. Besides the pure green coloring matter (to which the name chlorophyll may be restricted), yellow pigments (carotin or xanthophyll) are associated with it in the mosses, ferns and seed-plants. In some algæ browns or blues or reds may be present also. The green pigment particularly (and in part the others) enables the plant to absorb certain portions of the light. The energy thus gained is partly used in the making of new foods (see PHOTOSYNTHESIS). In the absence of chlorophyll, this work cannot be accomplished. Chlorophyll is probably being continuously produced and destroyed in green plants. It is not usually formed in darkness, and if light is excluded from a green plant the destruction of the chlorophyll leaves it a pale yellow. Autumnal colors are due in part to the decomposition of the chlorophyll.

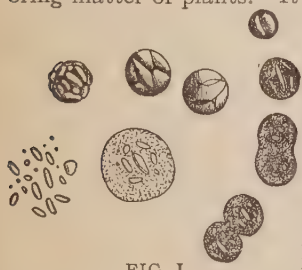
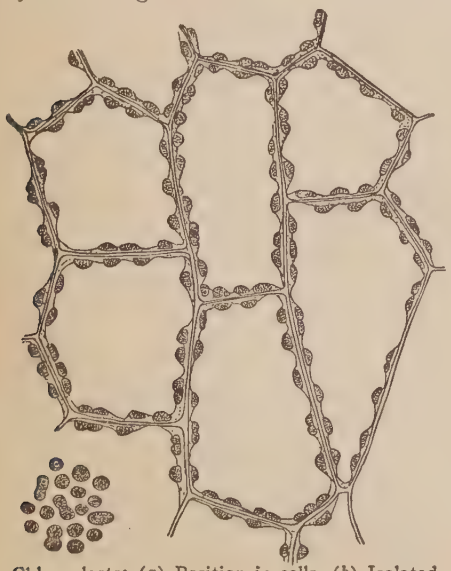


FIG. I



Chloroplasts: (*a*) Position in cells. (*b*) Isolated

Chloroplast (*klō'rō-plăst*), a protoplasmic body in plant cells that is stained by chlorophyll, and thus gives the characteristic green color to plants. For the work of chloroplasts see PHOTOSYNTHESIS.

Choate (*chōt*), **Joseph Hodges,** a talented and eloquent lawyer, forceful public speaker and United States ambassador to England, was born at Salem, Mass., Jan. 24, 1832. After graduating at Harvard, he adopted law as a profession, and, joining W. M. Evarts in legal practice at New York, he rose quickly to eminence, owing to his high forensic abilities and soundness as a lawyer and counselor. His chief exploits at the bar were his defense of General Fitz-John Porter, when court-martialed on a charge of disobeying orders, and his vigorous campaign against the corrupt Tweed ring in the city government of New York. In 1894 he was chairman of the convention held to revise the constitution of the state of New York. He also took part in the argument before the supreme court of the United States as to the validity of the provision as to income tax in the tariff law of 1894, the court upholding his contention that the income tax could not be collected, but leaving the remainder of the tariff law in force. Mr. Choate was a nephew of the great Rufus Choate. He was noted as a public and after-dinner speaker. In Jan.,

JOSEPH H. CHOATE

1899 he was appointed ambassador to the court of Great Britain. He died at his home in New York City May 14, 1917.

Choate, Rufus, an American lawyer, was born at Essex, Mass., Oct. 1, 1799. He graduated at Dartmouth College, and commenced to practice law in 1823. He served as reprsentative and senator in Congress, but his greatest success was at the law. He became the foremost lawyer of New England, and undoubtedly was the first pleader of his day. His speeches and addresses show great oratorical power. He died July 13, 1859.

RUFUS CHOATE

Chocolate. See COCOA.

Choctaws (*chŏk'tăz*), a widely-spread tribe of Indians, living on the shores of the Gulf of Mexico from the Mississippi to the Atlantic. They lived more by rude farming than by hunting. They are a rawboned, alert but treacherous people. The French gave them the name of Flatheads, from their practice of flattening the heads of their children with bags of sand. De Soto fought a bloody battle with them in 1540. In the wars between the French and English settlers they sided with the French; though one of their great chiefs, Red Shoes, became the friend of the English. Some 500 families moved west of the Mississippi in 1803, and the remainder were offered citizenship by the Georgians; but they preferred to trade their lands for others west of the Arkansas in Indian Territory. They were governed by a written constitution, elected a chief every four years and had a national council of 40 members and trial by jury. Under this government they advanced fast, and in 1861 numbered, with the Chickasaws, who lived with them, 25,000, and owned 5,000 slaves. In the Civil War they took sides with the south and suffered great losses. Schools and missions have been established among them for a long time. The Choctaws in the territory number a little over 10,000.

Chopin (*shō-păn'*), **Frederic Francois,** a Polish pianist and composer, was born March 1, 1809. His waltzes, mazurkas and other compositions are peculiar in melody, rhythm and harmony, and have a great charm. He was one of the first pianists, and his playing like his music, had a captivating grace. He spent most of his life in Paris, where he died Oct. 17, 1849.

Christian IX (born in 1818), was crowned King of Denmark in 1863. At his accession he was misunderstood and coldly received by the people, but by his simple manners and democratic bearing he won their respect and esteem. In 1864 Schleswig-Holstein and Lauenburg, about one third of Denmark, were taken from him by Germany. This loss of territory was offset in part by a gain in prestige through his family alliances. One of his daughters became czarina of Russia, another queen of England, one son king of Greece and another king of Norway. He died Jan. 29, 1906, and was succeeded by his eldest son who ascended the throne Jan. 30, 1906, with the title of Frederick VIII. He died of apoplexy in the streets of Hamburg, May 14, 1912. Crown Prince Christian who took the title of Christian X, succeeded him.

CHRISTIAN IX

Christian Endeavor Movement, The. This movement originated with the formation of a small society of 50 members in the Williston Church of Portland, Maine, under the direction and with the inspiration of the pastor, Dr. Francis E. Clark, on the evening of February 2, 1881. In February, 1906, after 15 years of life, the movement showed 66,000 societies, with 4,000,000 members, found not only in the United States, but in Canada and Great Britain, in many countries of Europe, in India, China and Japan, in Australia and in Africa. The different societies are independent, united only by a community of principle and plan. There is, however, a corporation, bearing the title of United Society of Christian Endeavor, of which Dr. Clark is chairman. This society collects and distributes the funds that may be sent to it, and seeks to promote in every way the movement. Most of the societies have a constitution that declares the purpose to be "to promote an earnest Christian life among its members, to promote their mutual acquaintance and to make them more useful servants of God." There are active members and associate members. The former bind themselves to attend every meeting of the society to which they belong, unless prevented by absolute necessity, and to take some part, however slight, in every meeting. They are to read the Bible daily and to assist the pastor in the work of the church as he shall direct. The society is interdenominational. A special

feature of the society has always been the appointment of many committees to attend to and systematize various aspects of church work. Conventions are held every year in different parts of the United States. Similar conventions are held in foreign countries. The World's Christian Endeavor Union has been formed, and the Society in America publishes a journal, *The Christian Endeavor World.*

Christian Era, the great era, now almost universally accepted, especially in Christian countries, for the computation of time. It is commonly held to correspond to the date of the birth of Christ; but this is scarcely accurate, since that epochal event took place four years before the era now accepted as the commencement of the new epoch in reckoning time. The centuries before the advent of Christ are marked B. C. (before Christ); those that follow are marked A. D. (*anno Domini*). The era is computed from Jan. 1 in the 4th year of the 194th Olympiad; the 753d from the foundation of Rome; and the 4,714th of the Julian period. The new epoch was introduced in Italy in the 16th century, and came into use in England some centuries later.

Christian Science. See EDDY, MARY BAKER.

Christiania, capital of Norway, was named after Christian IV, who began to build the city in 1624. The national parliament, the storthing, with its two houses, the Lagting and the Odelting, meets here. It has a large university, a fine observatory, two palaces of the king of Norway and a national picture-gallery. An interesting establishment in vogue here is the Steam Kitchen, which provides good and cheap dinners for working people. The great industry is its shipping trade, both foreign and coasting. Its chief exports are of timber and fish. Population, 241,834.

Christina (*krĭs-tē'nä*), queen of Sweden, the only child of the great Gustavus Adolphus, was born Dec. 17, 1626. She succeeded her father when only six years old. Beautiful and brilliant, she was given the schooling then only given to men. She took the ruling power into her own hands in 1644, and six years later, in accordance with her mannish desires, was crowned king instead of queen. She ruled ably for the next four years, but her wayward restlessness could not brook longer the restraints on her personal action which her position of queen made her keep, and she resigned the throne in favor of her cousin Charles, reserving, however, authority over her own household. At this time, when but 28 years old, she traveled over Europe somewhat like a female knight-errant, now becoming very religious at Brussels, now entering Rome on horseback dressed as an amazon, and later shocking Paris by having her grand equerry put to death in her own household for treason. Tired of this wandering life, she thought the death of Charles a good chance to become queen again. But in this she failed. She died at Rome, April 19, 1689.

Christmas (*krĭs'mas*), the day on which the birth of Jesus Christ is observed. The first certain traces of the festival are found about the time of the Emperor Commodus (180–192 A. D.). In the reign of Diocletian a churchful of Christians, gathered to celebrate Christmas, were burned by order of the emperor. The birth was celebrated in May, April and January by the early Christians. It is almost certain that the 25th of December is not Christ's birthday, as it is the rainy season in Judæa, and shepherds could hardly be watching their flocks by night in the plains at that time. The present date came to be used probably because all heathen nations celebrated that season with great festivities, as the old Norse Yule-feast. The beautiful Christmas carols at first were manger-songs, telling the story of Christ's birth. The Christmas-tree with its hanging toys was a custom borrowed from the Romans, and is told about by the poet Vergil. The visit of Santa Claus bearing gifts belongs properly to December 6, the festival of St. Nicholas.

Christmas Carol, A, the first and best of strictly Christmas stories, is one of the masterpieces of Charles Dickens. Written for the Christmas of 1843, it was marked by the best gifts of the novelist, humor, fancy, simplicity and tenderness. The old miser, Scrooge, is visited and reformed by the ghosts of Christmas past, present and future.

Chris'topher, Saint, according to the old story, lived in Syria, and was put to death as a martyr by the Emperor Decius. He is said to have been 12 feet in height and of great strength. In the pride of his strength, he would serve only the mightiest upon earth. Once he served a powerful king for a while; but seeing his master's fear of the devil, he at once became the devil's servant. But one day he saw the devil trembling before an image of Christ, and decided to serve Christ only. As punishment for not having served Him before, he undertook to carry travelers across a broad stream. One day, so the the story goes, Christ came to him in the form of a little child, to be carried over, but at every step the burden grew heavier and heavier. "Wonder not, Christopher," said the child, "for with Me thou hast borne the sins of all the world."

Christ's Hospital, a noted school in London, England, with an ancient foundation. It was founded by Edward VI in 1553, as a hospital for orphans. It is usually called the Blue-coat School, from the odd dress worn by the boys. About

30 years ago the cap and petticoat were discarded, but otherwise the garb or uniform is the same to-day as that worn in the 16th century: a blue coat with a red girdle round the waist, knee-breeches, yellow petticoat and stockings, a clergyman's bands at the neck and a small blue worsted cap. Coleridge, Lamb, Sir Henry Maine and other prominent men were educated here.

Chron'ograph, an instrument, of delicate mechanism, for measuring and recording minute portions of time. It is used by astronomers for registering the instant occurrence of an astronomical event, directly it happens and is visible. It is also used at horse-races, to record the starting of a race and the instant each horse in the contest passes the winning-post. The chronograph usually registers to one tenth of a second; the delicate records are made by electro-magnetism, and can be brought into action or stopped at any instant through the manipulation of an electric key by the finger. Of this type is the chronograph known as Schultze's, which is so precise and delicate that it can register time to the 500,000th part of a second. Of the ordinary type of chronometer is Benson's which, in principle, is a lever-watch, with a double seconds-hand, the one superimposed on the other. The one in use by astronomers is Strange's, which is connected with the pendulum of an astronomical clock, and makes a dot or other mark on a sheet of paper at the beginning and end of each swing of the pendulum.

Chronometer. See CLOCK.

Chrysan'themum (meaning golden flower), is a flower growing in the temperate parts of Asia, Europe and North America. There are many varieties, such as the ox-eye daisy, corn marigold, golden feather and marguerites. The most popular variety in our gardens and flower-markets was highly esteemed in China long before it was known in Europe, and gives its name to the Chinese order of honor, the Order of the Golden Flower. It was brought to Europe in 1764, and now there are many hundred varieties. The colors are very various and beautiful. It is popular also because it flowers during the late autumn months. The cultivation of the chrysanthemum and the developing of new varieties have been very much extended in the last few years. Chrysanthemum shows are usually held in all our large cities.

Chryseis, the daughter of Chryses, a priest of Apollo, had, according to the story of the Trojan War, been one of the captives of Achilles. In the partition of the booty she fell to Agamemnon, who refused her father's offer of ransom. Apollo avenged the insult by visiting the Greek army with a plague, until Agamemnon, its leader, was compelled to restore Chryseis to her father.

Chrysostom (*krĭs'ŏs-tŏm*), **John, Saint** (meaning "golden mouthed"), was born at Antioch about 347 A. D. His mother was a pious woman and devoted herself to her son, who grew into an earnest, gentle and serious young man. He studied, became a monk and spent much time in preaching, in which he was very successful. His eloquence caught the attention alike of Jews and heathen, and gained him the reputation of the greatest orator of the ancient church. Appointed to an important office in Constantinople, he pared down the cost of living and gave what was saved to charities, so that he was called John the Almoner. For trying to reform the lives of some of the monks about him, he was banished to the Taurus Mountains. Even here he could not keep silent, but began to preach to the Persians and Goths in the neighborhood and to write *Letters* and *Homilies*, or explanations of parts of the Bible, which to-day are in the front rank of the literature of the church. But another order came to banish the golden-tongued preacher to the most distant corner of the Eastern empire. So the old man was made to travel on foot and with his bare head exposed to the burning sun. This was more than he could bear, and he died on the way, Sept. 4, 407 A. D.

Chuquisaca (*chōō'kē-sä'kä*) or **Sucre,** the capital of Bolivia, is built on a tableland almost 9,000 feet above the sea, shut in by mountains. It has a large cathedral and a college. Its citizens are mostly a mixture of Spaniards with Indians. Population, 23,416. Chuquisaca is also a department of the republic; area 26,400 square miles; population about 237,143, consisting of Indians, Mestizos and whites.

Church, Frederick Edwin, a celebrated American landscape-painter, was born at Hartford, Conn., May 4, 1826. He first painted scenes from the Catskill Mountains. He then traveled in South America, and painted his *Heart of the Andes*, *Morning on the Cordilleras*, etc. He also made a sketching trip to Greece and Palestine. His *Tropical Scenery* and *View of Niagara Falls from the Canadian Shore* are among his best works. He died in 1900.

Church-Councils. Church-councils are of two kinds, general or œcumenical councils, at which the whole church is represented, and others, in which some division of the church, as a sect or a local division, is represented. The council may meet to discuss matters of doctrine or matters of discipline. Some councils consist of clerical members only; others admit lay members, that is, those who have not been ordained. The latter are more common in Protestant churches. The lesser councils are too numerous to mention, occurring in connection with every sect. The œcumenical councils were held before the division of

the church (about 800 A. D.) into the Eastern and the Western church. The first was held at Nicæa, in Asia Minor, 325 A. D., under the Emperor Constantine. It was in that council that Athanasius won the victory for the doctrine of the trinity, against the unitarians under Arius. The next councils were those of Constantinople (381), Ephesus (431), Chalcedon (451), Constantinople (553), Constantinople (680), Nicæa (787). The Greek or Eastern church recognizes only these as general, because it did not attend the rest; but the Roman church considers the following to be general, holding that the other churches are not real churches, that there is but one church, the Roman Catholic: Constantinople (869), Lateran (1123), Lateran (1139), Lateran (1179), Lateran (1215), Lyons (1245), Lyons (1274), Vienne (1311), Constance (1414), Basel (1431), Florence (1438), Lateran (1512), Trent (1545), and Vatican (1869). The authority of the councils has given way to that of the pope, especially since the council of Trent. At the last council, the Vatican, membership was limited to cardinals, bishops, mitred abbots and generals of religious orders.

Churchill, Randolph Henry Spencer, Lord, an English statesman, member of Parliament and second son of the sixth Duke of Marlborough, was born in 1849, and died in 1895. In 1874, on a visit to this country, he married Jennie, daughter of the late Leonard Jerome of New York. In the same year he entered the British Parliament, and later on became a versatile and often audacious speaker, the life and soul of what was then known as the Fourth Party in the chamber. He subsequently became one of the leaders of the Conservative party, and was recognized as a new and powerful, if at times somewhat erratic, political force. He took a prominent part in the Bradlaugh debates, and when Mr. Gladstone fell and Lord Salisbury came into power, Lord Randolph Churchill was appointed chancellor of the exchequer and leader in the commons. In Dec., 1886, differences with his colleagues led to his resignation. He again (in 1892) became a member of Parliament. He died at London, January 24, 1895.

Churchill River, 1,000 miles long, flowing into west shore of Hudson Bay near Fort Churchill in the District of Keewatin (Canada). Direction northeasterly.

Churchill, Winston, American novelist and contributor to magazines, was born at St. Louis, Mo., Nov. 10, 1871, and graduated in 1894 from the United States Naval Academy. For a time he was editor of the *Army and Navy Journal*, of New York, and managing editor of *The Cosmopolitan*. He has published a number of short naval stories and character sketches of naval officers; an account of the naval battle of Santiago; and several notable novels, dealing powerfully with important eras in American history. These stories include *The Celebrity*, *Richard Carvel* and *The Crisis*, the latter a story of the Civil War.

Later works are *The Crossing*, a love story entitled *Coniston*, *Mr. Crewe's Career*, *A Modern Chronicle* and *The Inside of the Cup*.

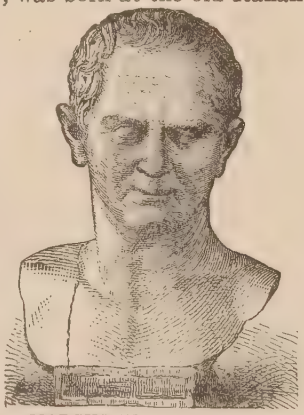
Churchill, Winston Leonard Spencer, son of the late Lord Randolph Churchill, English Parliamentary Under-Secretary for the colonies, under Campbell-Bannerman, and first lord of the admiralty under Asquith, was born November 30, 1874, and educated at Harrow and the military school at Sandhurst. In 1895 he entered the army, and saw considerable fighting, and was in many active expeditions in different parts of the world. He first served with the Spanish forces in Cuba; then in India; and later in the Nile expeditionary force in Egypt, and for his services at Khartum received a medal and clasp. Toward the close of 1899 he proceeded to South Africa, and was taken prisoner by the Boers, while acting as war-correspondent. He afterward escaped from custody at Pretoria, and proceeding to Cape Colony he joined the South African Light Horse as lieutenant. With this body of troops he saw much service in the colony, was in many hot engagements and was present at the taking and occupying of Pretoria by Lord Roberts in June, 1900. He remained first Lord of the Admiralty until after the outbreak of the European War but was replaced in that office in 1915 by Arthur J. Balfour on the formation of a coalition ministry under Asquith (*q. v.*). His publications embrace *The Story of the Malakand Field-Force; Savrola* (a novel); *The River War*, an historical account of the reconquest of the Sudan; *London to Ladysmith via Pretoria;* and the narrative of *Ian Hamilton's March*. He has also written a *Life of Lord Randolph Churchill*, his father, which is regarded as a fine piece of biographical literature and *My African Journey*. See Scott's *Winston Spencer Churchill*.

Churubusco (*chōō'rōō-bōōs'kō*), a village six miles south of the City of Mexico, where was fought a battle between the Americans, under General Scott, and the Mexicans under General Santa Anna, Aug. 20, 1847. The road to Mexico is a high, paved causeway crossing the River Churubusco by a stone-bridge. At this point on the high river-banks Santa Anna made a stand, to arrest Scott's advance to the capital. Scott had won the battle of the Contreras the same day, and he carried the Churubusco position after smart fighting, with a loss in both actions of 1,065; Mexican loss, including prisoners, 7,000, besides artillery.

Cicada (*sĭ-kā'dà*), an insect improperly known as the 17-year locust. The name

locust should be restricted to certain grasshoppers, which are the true locusts. The cicadas appear in great numbers at long intervals. Those of the north require 17 years for their development, those of the south 13 years. The eggs are laid in slits in twigs of trees, and are hatched after a period of six weeks. Instead of a caterpillar or grub, a nymph is produced. The latter has legs, but no wings. They drop to the ground and burrow and live by sucking the juices from the roots of trees. After 17 years they reach maturity and come to the surface. The skin splits open along the back and the perfect insect comes out. They attract attention far and near by their loud, shrill singing. Their life in this stage lasts but a few weeks. In some localities several broods overlap, which explains the fact that the insect appears in those localities more than once in the period of 17 years. The dog-day harvest-flies are also cicadas. These develop in two years, but, as there are two broods, they appear annually.

Cicero, Marcus Tullius, orator, statesman and writer, was born at the old Italian town of Arpinum, 106 B. C. In boyhood he went to Rome, and was put through a thorough and wide course of study to fit him to be an orator. Among the Romans the calling of an orator was what we would call that of a lawyer and a politician, the orator pleading law cases before the bar and speaking on political questions in the senate, thus requiring a wide and varied knowledge. In 76 B. C. he held an appointment in Sicily, where he became popular with all classes and obtained the information which enabled him, in 70 B. C., to impeach successfully the wicked governor of Sicily, Verres. This scoundrel felt himself crushed by Cicero's opening speech and fled the country. The orator had already become well known by earlier speeches, and now became a power in the state, and rose rapidly still higher. In 63 B. C., at the age of 44, he was a consul, the highest office within reach of a Roman. In the same year, by his boldness and promptness, he checkmated the dangerous conspiracy of Catiline, delivering in the senate those famous *Orations against Catiline,* which brought the senators almost to a man to his support. Cicero was now at the height of his power, but his hot eloquence had carried the senate too far. Some of Catiline's band had been put to death by a simple order of the senate. This was a stretch of power for which Cicero was held responsible, and the Father of His Country, as he had been called but a short time before, was banished and his two houses were plundered. Though the changeable people welcomed him back with shouts in the following year, he never regained power. No longer confident in himself, he halted between allegiance to Cæsar and allegiance to Pompey, and was held to be a time-server. It was a time when the old republic was crumbling to pieces, and only a strong man could build upon its ruins what would be stable and lasting. Cicero was gentle, amiable, clever and learned, but strong he certainly was not.


MARCUS TULLIUS CICERO

The later years of his life were spent chiefly in pleading at the bar and in writing essays. After Pompey's overthrow at the battle of Pharsalia, he became Cæsar's friend; but he never liked Cæsar's other friend, Mark Antony; and in the year following Cæsar's death the aged orator appeared once more in the senate, making his famous speeches against Antony, which he called *Philippics,* after the title of Demosthenes' orations against Philip of Macedon. These cost him his life. Antony's proscription-list of his enemies, who were thereby outlawed, was published, and Cicero's name was on it. Old and feeble, he fled, pursued by Antony's soldiers, and was overtaken as he was being carried in his litter down to the shore to embark. With courageous coolness he put his head out of the litter and told the murderers to strike. This was in December, 43 B. C.

Cicero as an orator stands in the first rank. Of his speeches that have come down to us, the finest perhaps are those against Verres and against Catiline. His essays on *Old Age, On Friendship* and *Whole Duty of Man* (de Officiis) are most pleasant reading. His letters are classics of epistolary literature. It was a remark of Erasmus: "I feel a better man for reading Cicero."

Cid (*sĭd*), **The,** the name given to Rodrigo Diaz, a famous warrior of Spain, who was born about 1040. He was commander of the army of Sancho II, king of Castile, in the wars in which that king tore Leon and Galicia from his brothers. Sancho was killed treacherously during a siege, and Alfonso, the banished king of Leon, became king. The Cid was soon afterward banished himself, and with a motley following he offered his services to the king of Saragossa and fought ably against his enemies. After besieging Valencia on his own account for years, he conquered the

city, and reigned over the district until his death, five years later, in 1099. He appears to have been a bold and able soldier and a born leader of men. These adventures and many other things which he never did are told in the *Cid Poem*, written in the 12th century, probably the oldest literature in the Spanish language. The story of the Cid was told by the story-tellers who wandered over the country, welcomed at every castle, where they enlivened the long evenings by telling stories of the national heroes, after making up adventures which they tacked on to the lives of such men as Charlemagne and the Cid. It was from these stories that the poem, with other chronicles and ballads about him, was made. On this story Corneille based his *Le Cid* and Southey his *Chronicle of the Cid.*

Cider is the fermented juice of apples. Usually, apples that are sour in taste are used, and late apples make better cider than early ones. The apples after gathering are left to mellow for some days. The juice is crushed out by passing the apples between fluted rollers or in mills of various kinds. The pulp is placed in bags or in wicker-work frames with holes, and the juice is drained into tubs. This juice is kept for the finest quality of cider. The rest is squeezed out in a press. This pressure, especially where unduly great, adds juice from the pipe and skins and gives it a coarser flavor, though in larger quantity. Eight to ten days' fermentation takes place in casks with large bungholes, the vinegary yeast frothing to the top, which is constantly removed. The cider is next freed of the sediment by being placed in fresh casks, and this is repeated in the spring. Champagne cider is made by bottling the juice before it is fully fermented. Cider contains from four to ten *per cent.* of alcohol.

Cienfuegos (*sē'ĕn-fwā'gōs*), a city of Cuba, is in Santa Clara province on the southern side of the island. Its harbor was discovered by Columbus in 1492, and is one of the finest harbors in the West Indies. The port's commercial advance in recent years has been so rapid that Cienfuegos has become the second seaport in Cuba. To-day it is the center of the sugar-trade on the Caribbean coast. The city has well-shaded, attractive streets, its residences are substantially built, and it is lighted by gas and electricity. The climate in summer is oppressive, but the winter climate agreeable. Railroads connect Cienfuegos with Havana and Sagua la Grande on the northern coast and with Santa Clara, the western terminus of the Santiago railway. Steamers give communication with New York. The population is 70,416. During the Spanish-American war the port was long blockaded by the American fleet.

Cimabue (*chē'mȧ-bōō'ā*), **Giovanni,** an Italian painter, was born at Florence in 1240. The art of painting had in his day fallen into decay, and Cimabue's attempt to follow nature, painting from a living model, was called "a new thing in these times." His two madonnas are still preserved in Florence, but he is best known as the teacher of Giotto and as the founder of the Florentine school of painters which included Michael Angelo and Raphael. He died about 1302.

Cimbri (*sĭm'brī*), a people who, together with the Teutons, came out of the north of Germany, and moving southward fought against the Romans in 113 B. C. At first victorious, they were prevented from ravaging Italy by Marius, who routed them in a battle near Verona in 101 B. C. In this battle they showed the greatest courage, even the women killing themselves and their children when they saw that all was lost. Years later, Cæsar and Tacitus speak of the Cimbri, who appear to have lived, a few in number, in the far north of Germany. They probably belonged to the German race.

Cimon (*sī'mŭn*), an Athenian commander, was the son of Miltiades, the conqueror at Marathon. At the time of the Persian War he was made one of the two commanders of the Athenian section of the Greek navy, commanded by the Spartan, Pausanias. His greatest encounter was in 466 B. C., with a Persian fleet of 350 ships at the River Eurymedon, when he destroyed or captured 300 vessels and also defeated the Persian land-force on the same day. He became very popular in Athens, but later was opposed by Pericles and the democracy and banished, though he was recalled in five years. He died during one of his sieges, in 449 B. C.

Cincinnati (*sĭn'sĭn-nā'tĭ*), the second largest city of Ohio and tenth in rank in the United States, is situated on the Ohio River in the southwest part of the state. It is built upon two terraces, the first 60 feet and the second 112 feet above the river, surrounded by a circle of hills, about 450 feet high, forming one of the most beautiful amphitheaters on the continent. The city embraces nearly 72 square miles, extending along the Ohio River for about 15 miles. The city and its suburbs cover the surrounding hills, which are reached by a series of street-railways with inclined planes, one having a height of 275 feet. Cincinnati is noted for the beauty of its suburbs, which stretch for miles in all directions, with costly residences and large and ornamental grounds. The suspension bridge between Cincinnati and Covington is 2,252 feet in length, and was built at a cost of $2,000,000. There are 18 parks and a zoological garden; Eden park, covering 215 acres, and Mt. Airy Forest, with 795

acres, being the largest. Of the 21 cemeteries, the largest is Spring Grove, containing 600 acres, and said by travelers to be the most picturesque cemetery in the world. The Tyler-Davidson fountain, a bronze fountain cast in Munich at a cost of $200,000, was the gift of a private citizen, and is one of the ornaments of the city. Among buildings of note are the hospital, erected at a cost of $4,000,000; the cathedral, with a stone-spire 224 feet high; the Masonic temple, the Art museum in Eden Park, the Gibson and Sinton hotels, Ingall's building, the great Exposition building and Music hall with its noted grand organ.

Cincinnati is an important commercial and manufacturing city, and, since 1870, a port of entry. It for many years was the leading city of the west, called the Queen City. Its trade in pork was the largest in the country until 1863. Its manufactures are numerous and extensive, especially in iron, leather, shoes, paper, soap and carriages. Cincinnati has always been noted for its interest in literary and educational matters, and it also has a wide reputation as an art and musical center. The Cincinnati University, with 263 instructors and 2,298 students, Lane Theological Seminary, medical and law schools, the art-school and museum, a free school of design, a free public library, mercantile library and historical library, Emma Louise Schmidlapp Memorial Library, and the Lloyd Library, devoted to botany and pharmacy, are among its many institutions. Its great school of wood-carving and the Rookwood pottery are each celebrated. The ware from this pottery ranks with the art-product of the most famous potteries of the Old World, and may be found in the best private collections on both sides of the Atlantic.

Cincinnati was permanently settled in 1788, and named in honor of the Society of the Cincinnati. The river trade, which began with the arrival of the first steamboat in 1811, gave it its early importance. It became a city in 1819. In 1845 the first railroad entered the city. The population is largely foreign, one entire part of the city, called "Over the Rhine," being German. Population, 405,898.

Cincinnati, Society of the, a society of officers of the Revolutionary army, organized at the close of the war to keep up friendships and especially to raise a fund for widows and orphans of their comrades who had lost their lives in the war. It was named from the old Roman hero, Cincinnatus, as many of the members had similarly left their farms at the call to arms. As membership was made to descend from father to son, an outcry was made against the society by Franklin and others, who saw in it the germ of a future aristocracy. This caused some of the branches to disband. But there still are several state societies in active existence.

Cincinnatus (*sĭn'sĭn-nā'tus*), **Lucius Quintius,** was made consul of Rome in 460 B. C. When the messengers came to tell him of his election, they found him ploughing on his small farm. Two years later he was made dictator. The barbarous Æqui had surrounded the consul Lucius Minucius and defeated him. Cincinnatus marched to his aid and rescued him. Sixteen days later he laid down the unlimited power of the dictatorship and went back contentedly to his small farm on the Tiber. At the age of 80 he was again made dictator. He was a favorite hero among the later Romans, who looked on him as a model of goodness and simple manners.

Cinematograph (*sĭn'ē-măt'ō-grăf*). This is an instrument which casts upon a screen a number of successive views which have been taken from a moving object, in so swift an order that the eye does not observe that the picture has been changed. The spectator appears to behold one and the same view, in which the objects are in actual motion. On an average about 100,000 pictures are needed for an exhibition which is to last one hour. The instrument was invented in 1894 by Edison.

Cinnamon. See SPICES.

Circas'sians, the name sometimes given to all the formerly independent peoples of the Caucasus, more strictly to the tribes living in the northwest wing. The Circassians are a handsome race, their girls being the most beautiful in the Turkish harems. They also are strong, brave and temperate. For years they struggled fiercely agianst Russia, to keep their independence, and in 1858–65, rather than submit, nearly the whole nation of 15 tribes, about half a million in number, left their country for the Turkish part of Asia Minor or the mountains of Bulgaria. See CAUCASUS.

Cir'ce, a sorceress about whom Homer tells us in his *Odyssey*. Round her palace in Ææa were many men and women whom she had changed into the shapes of lions and wolves by her drugs and charms. Twenty-two of Ulysses' companions she changed into swine, but Ulysses himself was given an herb, which protected him. So he went boldly to her palace, was unhurt by her drugs and persuaded her to disenchant his companions. She also taught him how to escape many dangers on his homeward voyage. Another story about Circe is that she poured the juice of poisonous herbs into that part of the sea where Scylla, of whom she was jealous, was accustomed to bathe, and so changed her into a horrid monster.

Circulation of Blood, the course of the blood in its round from the heart back

again. A simple case of circulation is illustrated in the crayfish, where the heart consists of a single chamber with muscular walls. When it contracts, the blood is sent, in arteries, forward, backward and downward; on its return path it passes through the gills. In the clam there is a two-chambered heart. In fishes there are two chambers; in frogs and toads three; in the highest reptiles and all birds and mammals four chambers in the heart. The ancients believed that the arteries contained air, and only the veins blood. Galen (131–200), in the 2d century, demonstrated that both arteries and veins contain blood, but a direct connection between the two was not thought of. In the 16th century such a connection was believed in by Vesalius and others. In 1628 William Harvey published a book in which he maintained that the quantity of blood leaving the heart and the rate at which it leaves made a return to the heart necessary. This marks an epoch in physiology. He did not, however, see the minute vessels connecting arteries and veins. It remained for Malpighi, in 1661, and Leeuwenhoek, in 1669, to demonstrate, with the microscope, the existence of minute tubes connecting arteries and veins, and thus to show that the circulation takes place in a series of closed tubes. For further facts regarding circulation see HEART.

Cir'cus, in Roman usage, was a large, oblong building, used for chariot and horse-races, athletic exercises and wild-beast fights. According to tradition, circuses originated with Romulus, and subsequently these games became popular, and several buildings were put up for their use, the largest being called the Circus Maximus. This was enlarged several times, and is reported to have held from 150,000 to 385,000 persons. In the time of Julius Cæsar it was 1,875 feet in length and 625 feet wide. It was oblong in form, rounded at one end and square at the other, with tiers of stone seats on the sides and curved end, while at the square end were stalls for the horses and chariots. The Romans were very fond of the chariot-race. Usually, four chariots raced seven times round the circuit. Boxing, wrestling and even battles were engaged in. Canals were also dug and sea-fights shown. Animals were brought from as far as Asia and Africa. Free shows were given by politicians to curry favor with the people. Pompey gave a five days' circus, during which 500 lions and 20 elephants were killed. Often the Romans would demand bread and circus-games from candidates for office.

Citizenship. The term citizen implies membership in a political community, and involves on the one side his allegiance to and support of that community, and on the other the protection of the citizen by the community. It does not imply the right to vote or to hold office. These privileges may be and often are withheld from citizens, while granted to those who are not citizens. This modern use of the term citizen must be contrasted with the original use, which prevailed among the Greeks, and which is thus defined by Aristotle: A citizen is one who has the right to take part in both the deliberative and judicial proceedings of the community of which he is a member. Our idea of citizen is related to that of subject, as that term was used in England when this country separated itself from England; for a subject meant one who owes allegiance to the king and demands protection from him. The country with us takes the place of the king, — that is the difference. By the original constitution of the United States it was left uncertain whether citizenship related in the first place to the state and only secondarily to the nation, or *vice versa*. The fourteenth amendment, passed by Congress in 1866, approved by the requisite number of states and proclaimed law in 1868, decrees that all persons born or naturalized in the United States and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside. This made national citizenship fundamental, and declared that state citizenship follows from it. Those living in territories and the District of Columbia are not citizens of any state, though they may be citizens of the United States.

Citizenship does not rest on descent, fundamentally, but on the fact of birth on the soil of the United States. A person born of alien parents on the soil of the United States, unless he reserves allegiance to the country of his parents, is a citizen. Exceptions are Indians not taxed and persons born in the Philippine Islands until they shall be declared a territory (Supreme Court decision, May 1901). Citizenship is *extended* to those born abroad of a father who is a citizen, and to an alien woman married to a citizen (Acts of Congress, April, 1802, and Feb., 1855). The third extension of citizenship is to naturalized persons. To be naturalized the alien must have declared his intention to become a *bona fide* citizen at least two years before admission, must have resided in this country five years, and must swear that he does not believe in polygamy or disbelieve in organized government. He must speak English. An alien landing before he is 18 may be naturalized at 23 without a previous declaration of intention. The fourth extension is to one whose father is an alien, and who himself was born abroad, but who is under 21 and resides in this country when his father is naturalized.

Citizenship does not give the right of suffrage, and suffrage may be conferred without citizenship. To prevent the levy of reckless taxation, propertyless citizens are in some states deprived of a vote; while on the other hand many states extend the right to vote to those who have not yet become citizens, but have declared their intention to do so. The fourteenth and fifteenth amendments do not require that citizens be permitted to vote. The fourteenth amendment declares that what privileges and immunities citizens possess by the laws of the state and the nation shall not be abridged. But voting is not such a privilege. The fifteenth amendment simply declares that, whatever limitation the state may impose in the matter of voting, it shall not be based on "race, color or previous condition of servitude."

In ancient states the right to trade and to the protection of the laws rested upon citizenship. But this rule does not prevail in modern civilized states. Citizenship also means membership in a city, and then largely refers to the rights that follow from the fact of being taxed. The member of any republic, as that of France, is called a citizen. A British subject also styles himself a British citizen, because of the democratic basis of his government.

Cit'ron, the fruit of a species of *Citrus* (*C. medica*), a genus of the rue family, to which belong also the orange and lemon. The citron is a large lemon-like fruit with

CITRON

a thick rind, which is used in the making of preserves. Citron cultivation in the United States is chiefly developed in Florida and California.

Citrullus (*sĭ-trŭl'ŭs*). A genus of plants of the gourd family, which includes the watermelon (*C. vulgaris*). The three species are widely distributed in Africa, the melon belonging to tropical and southern Africa. One of the species (*C. colocynthis*) from the Mediterranean region yields colocynth, a drug obtained as an extract from the fruit.

Civil Service is the executive branch or department of government, composed of those who serve the state or crown in a civil capacity, as opposed to those employed in the military and naval services. In England it is one of the oldest institutions of the country, dating from the earliest monarchical times, though it is only within the past century that the English civil service has assumed its present vast proportions. In this country, as in all enlightened states, the civil service branch of government is usually separated into three distinct departments, viz.: the legislative, judicial and executive branches. In the United States the divisions of the executive civil service are—the departmental service, the customs service, the postal service, the government-printing service and the internal-revenue service. The number of positions in the United States executive civil service is now close upon 330,000, of which more than half are classified competitive positions, and all employed are under civil-service rules, prescribed by act of Congress in 1883. That act authorized the president to appoint three civil service commissioners to regulate and improve the service, to make regulations to govern the examinations and to investigate and report upon all matters touching the enforcement and effect of the rules and regulations. The purpose of the law and its governing rules is to establish, in the parts of the service within their provisions, a merit-system whereby selections for appointments shall be made upon the basis of demonstrated relative fitness without regard to political or other considerations. To carry out this purpose a plan of competitive examinations is prescribed, and, when vacancies occur, the appointee is drawn from the eligibles of the highest grade on the appropriate register; and every appointment is made at first for a probationary period of six months. It has to be added that there are what are known as preference claimants, viz.: persons who have served in the military or naval service of the United States, and were discharged by reason of disabilities resulting from wounds or sickness incurred in the line of duty. Such are released from all maximum-age limitations; are eligible for appointment at a grade of 65, while all others are obliged to obtain a grade of 70; and are certified to appointing officers before all others.

Examinations are also held for positions in the Philippines, Porto Rico and Hawaii

and for the Isthmian Canal service. The chances of appointment in the U. S. Civil Service are understood to be good for teachers, matrons, seamstresses and physicians in the Indian Service, for male stenographers and typewriters, draughtsmen, patent examiners, civil, mechanical and electrical engineers and for technical and scientific experts. Rules and regulations governing the admission of persons into the civil service in large cities and states, such as New York, are also prepared and acted upon through municipal civil service commissioners.

In Great Britain the departments of the civil service are the treasury, the exchequer and audit department, the foreign office (including the diplomatic service), the India, Colonial and Home offices, together with the three revenue-departments of the postoffice, inland revenue and customs. There are others, including the spending departments, the war-office, admiralty, board of trade, board of works, education office, privy council office, the stationery office, agriculture and fisheries, charity commission, ecclesiastical and church estates, government laboratories, observatories and record office, the mint, patent-office, meteorological office, national debt office, the local government board, etc. These are grouped under two grades—I and II—and appointments, for the most part, are made on the competitive plan. See Fish: *The Civil Service and the Patronage* and Goodnow's *Principles of the Administrative Law of the United States* (1905).

Civil War, The. See UNITED STATES.

Cladophyll (*klăd'o-fĭl*) (in plants), shoots or branches which have replaced leaves in their work and resemble them in form. The so-called leaves of the ordinary smilax of the greenhouses are cladophylls, the true leaves occurring beneath them in the form of small scales. The same word is sometimes written phylloclad.

Claiborne (*klā-bôrn*), **William,** an early Virginia colonist and secretary of state for the colony, was born in Westmoreland, England, about the year 1589, and died in Virginia about 1676. He came to Virginia in 1621, where he bought large estates, and ten years later established a trading-post on Kent Island, Md., in Chesapeake Bay, some seven miles from where Annapolis now stands. This island and post were subsequently claimed by Governor Leonard Calvert to belong to Maryland, and in consequence a long dispute ensued between Calvert and Claiborne in respect to it. During the period of the English commonwealth Claiborne took the parliamentary side against the Calverts of Maryland, and subdued Virginia in the name of the protector. Cromwell, however, did not endorse his actions, but restored the Calverts to power, and after the restoration of the Stuarts Claiborne fell in favor and retired to a neglected life upon his colonial estates. There was another of his name, WM. CHARLES COLE CLAIBORNE (1775–1817), who was governor of the territory of Mississippi from 1804 to 1812 and governor of Louisiana (1812–16).

Clam, the name applied to the fresh-water mussel and similar animals living in salt water. They have bivalve shells, held closed by muscles and open by a springy ligament on the back of the shell; therefore, the shell of a dead clam always stands open. They creep through the mud and sand of the bottom by means of a fleshy foot. A current of water is drawn through a tube and is strained through the plate-like gills; it then passes into a chamber in the body and out by another tube. The food consists of minute animals and organic matter in the water. This is separated by straining the water through the gills, and is carried to the mouth by the movement of small hair-like projections or cilia. The shell is secreted by glands in the mouth, which covers the body, and is enlarged by rings as the animal grows.

Clan (meaning children), a name given to men banded together because of having a common ancestor or because of any other tie; but the word almost always means the divisions of the Scottish Highlanders. The clan was made up of men dwelling together or having a common surname. The affix *Mac* (meaning son) was a common one among Scottish Gaels: the Macdonalds were the sons of Donald. The members of a clan were usually not all blood-kin; men of various births were in the habit of enlisting under chiefs as men now enlist in a regiment, often taking the chief's name, but often not. The clan was really a military band for self-defense and for pillage. The Scottish law required all clans to have, if possible, a man of rank and property at their head, who could be held responsible for their good conduct. Clans which could find no security were called broken clans; their members were outlaws, and might be hunted down like wild beasts. The McGregors were a noted broken clan; their name was proscribed, and clansmen who wished to live peaceably in the lowlands, changed it slightly, calling themselves Gregor, Gregory, Grierson, etc. In general the great landowners were also mighty chiefs; men from broken clans were often received by the chief into the clan by bonds of man-rent, under which they engaged to follow their captain in all his feuds and quarrels, this being a form of the feudal system. But often the landlord was not the chief, and against his will the people of a clan usually followed their chieftain. The clan's name was kept up, as a reminder of past times, long after the

tribal system had died out. The Scottish rebellions of 1715 and 1745 induced the British government to suppress or break up the connection that existed between the clansmen and their tribal or family chiefs.

Clar'endon, Edward Hyde, Earl of, historian and statesman, was born Feb. 18, 1608, at Dinton, England. When young, he had such gay companions as Ben Jonson and his lifelong friend, Falkland, and, as he himself said: "He never thought himself so good a man as when he was the worst in the company." As a member of the short and long parliaments he sided against the king, Charles I, but in 1641 drew back and thenceforth supported Charles, composing his answer to the Grand Remonstrance and advising him in the troublous times which followed.

Under Charles II he was high chancellor. His efforts were directed to the restoring of the kingdom to the condition of things which existed 20 years earlier. He looked with equal sourness on Charles' vices and religious toleration, displeased Cavalier and Puritan alike, and was blamed for the sale of the fortress of Dunkirk to France and even with the Great Fire and the Great Plague. Impeached for high treason, in 1667, he spent the remainder of his life in exile. His *History of the Rebellion in England* is an apology for the course of himself and Charles I, rather than a fair and impartial history. He died in France in 1674.

Clarendon, George William Frederick Villiers, Earl of, an English diplomatist, was born in London, Jan. 12, 1800. He was a man of genius and charming manners, of rare tact and perfect temper, qualities which insured his success in the diplomatic service, in which he became distinguished. As ambassador to Spain, in 1833, he used the large influence which he soon gained in helping Espartero to establish the government of Spain on a constitutional basis. In 1847 he became lord-lieutenant of Ireland, where he had a rebellion and a famine to contend with. In 1853 he was placed at the head of the foreign office, and upon him fell the responsibility of the Crimean War and at its close the negotiations in regard to the balance of power in Europe. He died on June 27, 1870.

Clarinet (*klăr-ĭ'-nĕt*) or **Clarionet,** a wind-instrument, usually of wood, in which the sound is made by a single thin reed. It was probably invented by Joseph Denner, of Nuremberg, in 1690; but it has since then been much changed and improved, so that it now is one of the best of wind-instruments. The tube is round, and enlarged at the end in the form of a bell. It has holes to be covered by the fingers and left thumb, and keys, usually 13, to give the extra tones. The mouthpiece is flattened on one side, along which the reed is laid, leaving a slight opening so that when blown the reed vibrates against the mouthpiece and thus causes the sound. The clarinet has a much greater compass than the flute. It is used in orchestras and is the leading instrument in military bands.

Clark, Alvan, American optician, engraver and manufacturer of telescopes, at Cambridge, Mass., was born at Ashfield, Mass., March 8, 1808, and died at Cambridge, Mass., Aug. 19, 1887. Early in life he was a portrait-painter; but in 1845 he turned his attention to the making of achromatic lenses and manufacture of telescopes. Associated wtih his sons, he constructed object-glasses for universities, for the Naval observatory at Washington and for the Lick observatory in California. He also had orders for his firm from Russia, from the Imperial observatory at Pulkowa. After his death, in 1887, his two sons pursued their father's vocation, manufacturing optical instruments, making improvements in telescopes, designing models, etc. One instrument, a 40-inch telescope, they constructed at a cost of half a million dollars for the Yerkes observatory at Lake Geneva, Wisconsin. One of the sons, Alvan Graham Clark (1832–97), was also an astronomer of note.

Clark, Francis E., the founder and president of the United Society of Christian Endeavor, was born in 1851 at Aylmer, Canada. He studied at Dartmouth College and at Andover, Mass., and was pastor in Maine and South Boston. He is the author of many books, and editor of the *Christian World.* The United Society of Christian Endeavor grew out of a small Young People's Society of Christian Endeavor which he founded at Williston Church, Portland, Maine, February 2, 1881.

Clark, George Rogers. This great pioneer and soldier was born at Monticello, Va., in 1752. Previous to the Revolutionary War he had gained experience as a land-surveyor and also as an Indian-fighter. At the opening of the war he moved to Kentucky, and was returned as a member of the first legislature of Virginia, Kentucky being then part of that state. In 1778 he organized and commanded the campaign to conquer what was known as the Illinois country, the woods and prairies around the great Illinois River. He drove the French as well as English settlers from the country or compelled them to submit to the authority of the Continental Congress. He captured and, later, recaptured the fort of Kaskaskia, taking many British troops prisoners. At the end of the war he still was in possession of this vast territory. And this fact was probably the chief argument that led the English and French to extend the domain of the newly-formed nation up to and beyond the Mississippi. But for Clark it is not unlikely that the

Northwest Territory would have been handed over to England or Spain in the treaty of 1783. The legislature of Virginia created Clark a brigadier-general, and gave him 8,049 acres of land in what is now the state of Indiana, not far from Louisville. Twice he was presented with a sword. But after the war his energy led him astray. He led an unsuccessful campaign against the Wabash Indians, and tried to organize an expedition to open the Mississippi River to navigation against the authority of the Spanish, with whom we were at peace. He spent the last years of his life in poverty on the land that Virginia had granted him. He died in 1818. Clark Street, Chicago, is named in his honor.

Clark, James Beauchamp, popularly called "Champ," one of the most popular Democratic politicians of his day, was born in Kentucky in 1850. Before he became prominent in politics he worked as a farm laborer, clerk, editor and lawyer. From 1889 until his death in 1921 with the exception of four years, he served in the House of Representatives, and from 1911, to 1919 was Speaker. His great personal popularity was demonstrated in the presidential campaign of 1912; he was the leading candidate in the primary elections, but in the party convention was defeated by Wilson.

Clarke, John Hessin, distinguished American jurist, was born at Lisbon, Ohio, Sept. 18, 1857. He was graduated from Western Reserve University in 1877, and in the following year was admitted to the bar. He practiced his profession at Lisbon for two years, then removed to Youngstown, where he lived until 1897, and from 1897 to 1914 practiced at Cleveland. In 1914 he was appointed U. S. district judge for the northern district of Ohio, and in 1916 he was appointed an associate justice of the United States Supreme Court by President Wilson. In this position he served with great ability, his influence in the direction of sound law and policy being seen not only in his own decisions but in those of his colleagues. He resigned in 1922, to give the remaining years of his life to activity in behalf of the public welfare without the hampering restrictions of public office.

Clark University was founded by Jonas C. Clark in 1887, in the city of Worcester, Mass., for the purpose of promoting research by post-graduate students in scientific rather than in philosophical or literary subjects. An undergraduate department, was added (1902), of which the late Carroll D. Wright, the well-known statistician, was made president. In the university proper, courses are now offered in mathematics, physics, chemistry, biology, anthropology, psychology, education, economics and sociology, history and modern languages. The president is G. Stanley Hall, the psychologist, father of child-study in America, and it is in the department of psychology and education that the university has secured the most notable results. The university is unique in offering a "degree of docent," certifying to fitness, both in scholarship and teaching ability, for an academic chair or college professorship. There are 31 fellowships, worth from $200 to $600 a year. There are exceptional facilities to get in touch with the latest literature upon the subjects above mentioned. The library contains about 40,000 volumes, and receives over 200 journals, mostly technical in character.

Clarke, James Freeman, an American clergyman, was born at Hanover, N. H., April 4, 1810. He graduated at Harvard College and Cambridge Divinity School, becoming pastor of a Unitarian church at Louisville, Ky., and afterward of the Church of the Disciples in Boston. Dr. Clarke became widely known as a religious writer. His best known books are *Ten Great Religions* and *Orthodoxy, Its Truths and Errors.* He died June 8, 1888.

Clark, Capt. Wm. See LEWIS AND CLARK EXPLORATION.

Clarks'ville, Tenn., a city and county-seat of Montgomery County, is located on the Cumberland River, about 40 miles from Nashville. The surrounding country is a tobacco-growing region, and the city has tobacco and snuff-factories and lumber and flour-mills. The Southwestern Presbyterian University is located at Clarksville, and the city is served by the Louisville and Nashville and Tennessee Central Railroads. Population, 8,548.

Claude Lorrain (*klōd-lŏr-rān'*) (real name Claude Gelée), landscape painter, was born at Champagne in 1600. When a boy, he was carried to Rome by a relative who deserted him. But he soon obtained a place as servant to a painter, learning to paint as he ground his master's colors. After wandering about Europe, he painted for ten years at Rome before his pictures were sought after; but four landscapes painted by him for the pope gave him the fame he had been working for. He painted about 400 landscapes. Among the best are the series, *Morning, Noon, Evening* and *Twilight.* Claude himself liked best his *Villa Madama,* keeping it in his study and refusing to sell it, even when the pope offered for it as much gold as would cover the canvas. He also produced etchings, of which *Le Bouvier* is the finest. Claude's pictures brought such high prices, even during his lifetime, that many copies and imitations have been sold as his. He died at Rome in November, 1682.

Claudius, Roman emperor, a nephew of Emperor Tiberius, was born at Lyons, in Gaul, in the year 10 B. C. A sickly boy, he was neglected and left pretty much to himself, growing up a timid student. When Caligula was murdered, he hid himself in a corner of the palace, fearing that he

would be the next victim. A common soldier, finding him, saluted him as Emperor; others entered and bore him to the camp, where he was crowned, 41 A. D. In his reign the southern part of Britain was conquered and Mauritania made a Roman province. At home his rule was mild in the main, but he was influenced by his wives—he married four times—to commit some cruel acts. Two of his wives, Messalina and Agrippina, were among the worst Roman women of whom we know; and it was Agrippina who poisoned him in 54 A. D. to secure the throne for her son, Nero. Claudius built the famous Claudian aqueduct, and spent large sums in other improvements at Rome.

Clausius (*klow'zē-ūs*), **Rudolf Julius E.,** a distinguished German physicist, born at Köslin, in Pomerania, Jan. 2, 1822; died at Bonn, Aug. 24, 1888. He was educated at Berlin University, where he later became *privat-docent* and still later an instructor in the school of artillery. In 1855 he went to Zürich as professor of physics in the Polytechnic school; two years later he accepted the chair of physics in the University of Zürich. From 1869 until his death he was professor of physics in the University of Bonn.

His best work was done at Berlin, for it was here, between 1845 and 1850, that he placed the science of thermodynamics upon a sound basis, building the entire structure upon the then recently discovered principle of the conservation of energy. In addition to this, his most important contributions are perhaps to the kinetic theory of gases and to the subject of radiant heat.

Clay is a term rather loosely applied to all sorts of earthy matter, which, when wet, becomes sticky or plastic. In this respect, clay is in contrast with sand. The stickiness depends in part on the size of the individual particles. The smaller they are, the more tenacious the clay. Clay originates from the decomposition of certain sorts of rock, especially those containing feldspar. In the popular use of the term no account is taken of the composition of clay, but silicate of alumina is a common constituent. Common clays also contain free silica, iron oxide, etc. When beds of clay are solidified by natural means, they constitute the rock known as shale. Flagstones are a variety of shale, and slate is a variety of rock formed from shale by great compression. Clay is widely used in the manufacture of brick, tile, pottery, etc. and in modeling. For the finer wares, such as china and porcelain, especially fine grades of clay (kaolin) are required. The value of the products manufactured from clay in the United States in 1898 exceeded $71,000,000. The leading states in the utilization of clay, in the order of their importance, are Ohio, Pennsylvania, New Jersey, Illinois and New York. The value of the clay-products of these five states in 1898 was considerably more than half the total value of clay-products in the United States.

Clay, Cassius Marcellus, American statesman, abolitionist and United States minister to Russia, was born in Madison County, Ky., Oct. 19, 1810, and graduated from Yale in 1832. For a time he practiced law in Lexington, Ky., became a member of the state legislature and was an active antislavery man and the editor of *The True American,* which brought him into collision for a time with the proslavery men of his state. He served in the Mexican War of 1846–47 and was taken prisoner. He afterward took part in the elections of Presidents Taylor and Lincoln, and in 1861 was appointed United States minister to Russia, in which capacity he served from 1863 to 1869. He died Nov. 28, 1913. See the *Memoirs, Writings and Speeches of Cassius M. Clay.*

Clay, Henry, a noted American statesman and orator, was born in Hanover County, Virginia, April 12, 1777. His father died when he was five years old, but his mother, a woman of great goodness and force of character, well supplied his place in the boy's training. After a meager amount of schooling, Henry entered a Richmond law-office. Commencing to practice at Lexington, Kentucky, he soon became known as an able lawyer, his high personal gifts, winning address and frank, hearty manner helping him here, as they did all through life. From the first he took an interest in public affairs, and after two years in the state legislature, was chosen United States senator to fill a vacancy. He at once became an advocate of the government's building roads, canals, etc., being known as a loose constructionist of the constitution, as it is called. His short term over, he went back to the Kentucky legislature. This was in the days of duels, and it is not strange that Clay should have fought two, one at this time in Kentucky and, later, one with John Randolph of Virginia, both growing out of politics. In 1809 he was chosen to fill a second vacancy in the senate. In this session he spoke in favor of protection to American manufactures against foreign traders. He also opposed the United States Bank, but later he changed his views in the matter, the only instance in which he ever changed his attitude on a political question. In 1811 he was elected a representative in Congress, and the day on which

HENRY CLAY

he took his seat was chosen speaker. He was heartily in favor of war with England, and named his committees with a view to an early declaration of war. The war party was in a majority in the 13th Congress, which met in May, 1813, and again Clay was made speaker. When overtures of peace were made by the British, Clay was appointed one of the commissioners, and helped to draft the treaty of Ghent. Re-elected to Congress while in Europe on this mission, he was chosen speaker for the third time, and, except one term, when he declined an election, he was a representative and speaker until 1825. At this session he made some of his finest speeches, in favor of the South American patriots who were struggling for independence from Spain; later on he was just as eager in behalf of Greece, when fighting to free herself from the yoke of Turkey. In 1821 he brought forward the famous Missouri Compromise; 20 years afterward, when South Carolina wished to secede on the tariff question, he proposed a gradual lowering of the tariff, such as would work the least harm to manufactures; and in 1850 he attempted, by compromise, to settle the slavery question, which his Missouri Compromise had failed to dispose of, and in other ways he stood between the warring factions of north and south, to bring about concessions that would, in a measure, satisfy both sides, thus winning the title of the Great Pacificator.

In 1824 Mr. Clay was one of the four candidates for president, and received 37 electoral votes. In 1832 he ran for president again; but was beaten by Jackson. He was nominated again by the Whigs in 1844, but beaten by Polk, who received 65 more electoral votes. Clay served as secretary of state in John Quincy Adams' cabinet, and, besides filling the two vacancies in the senate referred to, was chosen senator from Kentucky for three full terms. One of those who opposed him politically is on record as saying that as a congressional leader Mr. Clay had no equal in America. He was the most persuasive speaker in the country during what was called the golden age of American oratory. He was, further, most popular with his party, while few men had a larger following of personal friends. He died at Washington, D. C., on June 29, 1852.

Clayton-Bulwer Treaty, a treaty concluded in 1850 between the United States and Great Britain, by which the contracting parties agreed that neither power should obtain or exercise exclusive control over a ship-canal then contemplated to be constructed across Central America and connecting the Atlantic with the Pacific. The negotiators were, on the part of Britain, Sir Henry Bulwer Lytton (afterward Lord Dalling), brother of the novelist; and, on the part of the United States, J. Middleton Clayton, secretary of state under President Taylor. The treaty, about 1880 and 1900, once more came under public discussion, in consequence of efforts being made to proceed actively in the construction of the Nicaragua Inter-Oceanic Canal, which many of our senators and public men desired to place, untrammeled, under the control of the United States. A new agreement was reached in 1901 through the adoption of the Hay-Pauncefote Treaty. This treaty omitted the restrictions against fortification, and this has been interpreted by the United States as giving her the right to fortify. Without such a right, the defenders of this interpretation point out, her coasts would be far more open to attack with the canal than without it. Her objections to defending the canal by agreement among the Powers are that such treaties are often observed only so long as it is to the interest of the parties to observe them; furthermore, that under such an arrangement the canal would be as open to the fleet of an enemy as to her own. Under her treaty with Panama the United States binds herself to maintain the neutrality of the canal, the independence of the republic of Panama and that the canal shall be open to all nations on uniform terms.

Clearing-House. See BANKS

Cleary, The Most Reverend James Vincent, Archbishop of Kingston, was born at Waterford, Ireland, 1828, and studied theology at Rome, Maynooth (Ireland) and Salamanca, Spain. In 1854 he was appointed professor of theology in St. John's College, Waterford, becoming president in 1873. He was appointed bishop of Kingston (Ontario) in 1880 and archbishop in 1889. He reopened Regiopolis College (theological) at Kingston in 1896, giving a large private contribution for the purpose.

Cleburne, Texas, the county-seat of Johnson County, is located in a good agricultural region. Its leading industries are cotton-gins, flour-mills and machine-shops. The division-offices and shops of the Gulf, C. & S. F. R. R. are located here. Cleburne has good schools, and is a growing, progressive city. Population, 16,505.

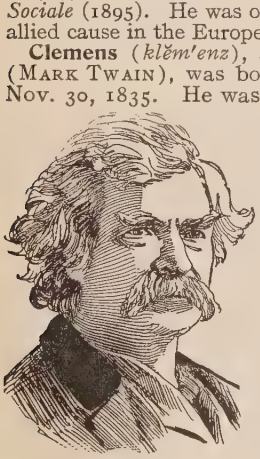
Cleistogamous (*klīs-tŏg'ā-mŭs*) **Flowers** In many flowering plants, in addition to the ordinary conspicuous flowers, there are other flowers which are very small and inconspicuous, and even concealed. The common violet is a prominent illustration of such a plant. Cleistogamous flowers are now known in very many genera. Such flowers never open, are self-pollinated, and are very productive of good seed.

Clem'atis. A genus of plants of the crow-foot family, consisting of climbing vines or erect herbs, all more or less woody. About 150 species are recognized, which

are widely distributed, about 20 of them being native to North America. Many of the climbing species are cultivated to cover walls, arbors, etc. The flowers are often very showy and of numerous shades.

Clémenceau (*klā'mān'sō'*), **George B. E.**, a French statesman and senator and premier of France and minister of the interior, under the presidency of Armand Fallieres. A clever debater and born orator, as well as an able journalist in his day, M. Clémenceau is one of the most picturesque figures in modern politics. A native of Brittany (he was born in 1841 in the department of La Vendée), he early studied and for a time practised medicine in Montmartre, and then travelled abroad, paying a brief visit the while to the United States. In 1869 he returned to France, and two years later was elected to the National Assembly, later on becoming a member of the Chamber of Deputies and leader of the Extreme Left. Though holding radical views, he has usually acted with moderation and good sense, though he was compelled successively to oppose Gambetta, Jules Ferry and the Boulangists. For a number of years he devoted himself to journalism, editing for a time not only his radical journal, *La Justice*, but contributing many notable articles to *L'Aurore*, among them several defending Dreyfus. besides writing fiction and social studies and taking active part in politics and the questions of the day. With the fall of Painleve in November, 1917, and in response to an overwhelming popular demand, Clemenceau was again made premier. Among his published works are *Les Massacres d' Armènie* (1896), *Les Phis Forts* (1898) and *La Mele Sociale* (1895). He was of great service to the allied cause in the European War (*q. v.*).

Clemens (*klĕm'enz*), **Samuel Langhorne** (MARK TWAIN), was born at Florida, Mo., Nov. 30, 1835. He was first a printer, and afterward a pilot on the Mississippi River. One of the commonest sounds heard on a Mississippi steamboat in shallow water is the call of the man sounding the depth of the water —"Mark Twain," meaning mark two fathoms; and when Clemens wanted a pseudonym, he took this familiar call. After spending some time in the silver mines of Nevada, he became a journalist in San Francisco. He became widely known as a humorist through his first book, *Innocents Abroad* which he brought out in 1869. *Tom Sawyer*, perhaps his most popular work, was published in 1876. Other of his works are *A Tramp Abroad* (1880); *The Prince and the Pauper* (1882); *Life on the Mississippi* (1883); *Huckelberry Finn* (1885); *Pudd'nhead Wilson* (1895); *Tom Sawyer Abroad* (1894); *Personal Recollections of Joan of Arc* (1896); *Following the Equator* (1897); *The Man that Corrupted Hadleyburg* (1900); *Christian Science* (1903); *How to Tell a Story* (1904); and *Editorial Wild Oats* (1905).



SAMUEL L. CLEMENS

Through the failure, in 1894, of the publishing house of Charles L. Webster & Co., of which he was the founder, Mr. Clemens was left deeply in debt. To retrieve his fortune he entered upon a lecturing tour, which extended around the world and furnished material for *Following the Equator*. On the completion of this tour he resided for a time in Vienna. He returned to America in 1900, and actively resumed literary work. In 1907 he visited England, where he was most heartily received, and was honored with the degree of D.C.L. from the University of Oxford. Mark Twain's humor is simple and direct, never strained, and has been described as "a sort of good-natured satire in which the reader may see his own absurdities reflected." He died April 21, 1910.

Clement (*klĕm'ent*), the name of 17 popes.

Clement XIV was born in 1705, near Rimini, Italy. He studied and taught philosophy and theology, was a friend of Benedict XIV, became cardinal under Clement XIII, and was elevated to the papal chair on May 19, 1769. In 1773 he issued his famous brief, suppressing the Society of the Jesuits. He was remarkable for his high character and learning as well as for his liberal ideas. He died on Sept. 22, 1774.

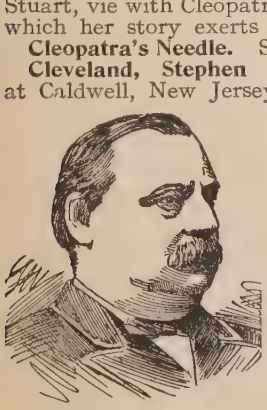
Clementi (*klā-mĕn'tē*), **Muzio** (1752–1832), an Italian composer and pianist. The work by which he is best known is his *Gradus ad Parnassum*, a series of 100 piano-studies. Though his contemporary, Mozart, spoke of him with a sneer, he was highly esteemed by Beethoven for the virile and artistic traits developed in his sonatas.

Cleopatra (*klē'ō-pā'trā*), daughter of the Egyptian king Ptolemy Auletes, was born in 69 B. C. Her father wished her to reign jointly with her brother, who was also, according to the Egyptian custom, to be her husband; but the boy's guardian drove her from the throne. She was just about to return from Syria, backed by an army, when Cæsar reached Egypt in pursuit of Pompey. Her charms won the great soldier to her cause, who placed her again on her throne, this time with a still younger brother as colleague and husband, of whom she quickly rid herself by poison. Soon after she followed her conquering lover to Rome

where she was covered with honors. After the battle of Philippi, Mark Antony summoned her to appear before him at Tarsus. The Egyptian queen sailed up the River Cydnus to meet him, in a sumptuous galley, arrayed as Venus rising from the sea. Then under 30 years of age, in the perfection of her Grecian beauty, she fascinated the heart of Antony, who henceforth became her lover and slave. Leaving her to marry Octavia, sister of Octavianus (afterward Emperor Augustus), he hurried back to the arms of Cleopatra, who met him in Syria and proceeded with him on the march to the Euphrates. After this, Antony's time was spent mostly with her at Alexandria, where he loaded her with gifts and honors. It was Cleopatra's counsel that Antony followed in risking the naval battle of Actium; and when she fled with her 60 ships, he forgot everything else, and "flung away half the world to follow her." When Augustus appeared before Alexandria, the fickle queen at once treated with him for her safety; while Antony, on being told that she had killed herself, fell on his sword. But finding the report was false, he had himself carried into her presence and died in her arms. Cleopatra, now Augustus' prisoner, finding that she could not win him, as she had won Cæsar and Antony, from disappointed pride took poison or killed herself by suffering an asp to bite her bosom (30 B. C.). Two women only, Helen of Troy and Mary Stuart, vie with Cleopatra in the fascination which her story exerts over men's minds.

Cleopatra's Needle. See OBELISK.

Cleveland, Stephen Grover, was born at Caldwell, New Jersey, March 18, 1837. He began to practice law at Buffalo in 1859. He was assistant district-attorney for three years, and in 1870 was chosen sheriff and, later, mayor of Buffalo. In 1882 he was elected governor of New York by 190,000 majority. After an exciting canvass he was elected president of the United States in 1884, receiving 219 electoral votes. The most important act of his administration was his message to congress in 1887 in which he announced a tariff policy on which the election of 1888 turned, when Mr. Cleveland was defeated by General Harrison, receiving 168 electoral votes to Harrison's 233. During his term as president he married Miss Frances Folsom of Buffalo, who brought social success and popularity to his administration.



GROVER CLEVELAND

In 1892 he was nominated a third time for the presidency, and was elected, defeating General Harrison. His second administration added to his fame as a wise and able executive. Retiring to private life at Princeton, N. J., he there interested himself in delivering addresses at Princeton University, a collection of which he published in 1904. His death occurred June 24, 1908 at his New Jersey home.

Cleveland, O., county-seat of Cuyahoga County, takes high rank among the cities of the United States in the rapid growth of its commercial interests, in the administration of its schools and other public affairs and its development of ideals of civic beauty and usefulness.

Standing on a plateau, which in places rises 200 feet above Lake Erie, with its great public square, wide thoroughfares lined with magnificent buildings, its residence districts with handsome homes in spacious grounds fronting on streets of majestic elms, wide spreading maples and other shade trees, it is one of the most attractive of our great centers of population. The arrangement and construction of its public buildings under what is known as the Group Plan at a cost of $25,000,000 was begun in 1902; a feature of this plan is the $6,000,000, Municipal Auditorium, completed in 1922. The city is divided by the Cuyahoga River, which is spanned by five great viaducts. In the public square is the Soldiers' and Sailors' Monument and statues of Moses Cleaveland, who laid out the city, and of Tom L. Johnson, a former mayor. The majestic Garfield Monument occupies a conspicuous site in Lakeview Cemetery, which lies on a ridge 250 feet above the lake. The city's numerous office buildings include the Cleveland Discount, Union Trust, Hanna, Bulkley, Kirby, East Ohio Gas, and Federal Reserve Bank. This last is one of the twelve banks in the Federal Reserve system. Cleveland also has several arcades running through an entire block, used for mercantile and office purposes.

Among the other beautiful structures are many churches of every denomination. Besides its fine public, it has many parochial schools and other educational institutions, including Western Reserve University, the College for Women, St. Ignatius College, St. Mary's Theological Seminary and Case School of Applied Science. It is one of the best governed cities in the country in its methods of caring for the poor, its reformatory institutions, such as the Warrensville Farms, its self-governed Boyville Home, its play grounds, parks, public baths and schools.

Of social, fraternal and business clubs, Cleveland has more than one hundred. Many of these are country clubs devoted to golf, tennis, hunting and other sports. Its downtown athletic club ranks with the finest in the country.

Its public piers, covering five acres, were built at a cost of $500,000. Its industrial plants line the numerous railroads entering the city and are scattered up and down the valley of the Cuyahoga River. The natural meeting point of Lake Superior iron ore, and coal from Ohio, West Virginia and Pennsylvania, Cleveland is the largest ore market in the world. It takes its place as one of the largest manufacturing cities in the United States and is noted for its iron and steel plants, its shipyards, automobile plants, and numerous other industries, including steel rails, car wheels, engines, boilers, cranes, printing presses, sewing machines, oil and gas stoves, and electrical apparatus and machinery. Optical instruments and other specialties requiring scientific skill are made in Cleveland in great variety. It is also a great center for the manufacture of wearing apparel, paints and chemicals. It is the site of one of the largest oil refineries in the country; is a large market for fresh water fish; handles large quantities of lumber and grain, and, what may be of particular interest to boys and girls, makes a large proportion of our chewing gum. Population, 701,803.

Cleveland was laid out in 1796 by Moses Cleaveland, and incorporated in 1836. The village bore his name and its spelling. This, however, from time to time changed, but the present spelling became permanent, it is said, in 1831, because the "a" made the word a misfit in the head-line of a newspaper.

Cliff-Dwellers. See PUEBLOS.

Clingman, Thomas Lanier, United States senator and Confederate officer, was born in North Carolina in 1812, and died at Raleigh, N. C., Nov. 4, 1897. After graduating, he studied law, and was a member of Congress from 1843 to 1858, taking a prominent part in the debates of the house. Originally a Whig, he deserted his old associates and became a Democrat, and in 1858 was elected to the senate. In 1861, when the Civil War broke out, he withdrew from the senate and entered the Confederate army, where he became brigadier-general, surrendering in April, 1865, with General J. E. Johnston. After the war General Clingman for many years devoted himself to mining and to scientific pursuits.

Clinostat, an apparatus for rotating plants in various planes to counteract the effect of a one-sided stimulus, such as light or gravity (see IRRITABILITY). It consists of a strong clock-work, with suitable regulating mechanism and devices for holding the pots in which the plants are grown.

Clinton, Iowa, a rapidly growing city, capital of Clinton County, Iowa, is situated on the Mississippi River between Davenport and Dubuque, and 140 miles by rail west of Chicago. It has communications with all points by a number of railroads, by steamboat-navigation on the river and two fine bridges across the Mississippi connects it with Illinois and the east. It possesses many thriving industries, embracing foundries, machine and car-shops, paper-mills, sash, door and blind-factories, furniture-factories, wagon-factory, wire-cloth factory and glucose-factory. Population, 25,577.

Clinton, Mass., a town of Worcester County, 12 miles from Worcester, on the Nashua River. It has several churches, a hospital and The Bigelow Free Public Library of 25,000 volumes. Located here are the Bigelow Carpet Co., the Lancaster Mills and the Clinton Wire-Cloth Co. Clinton has the service of the New York, New Haven and Hartford and the Boston and Maine railroad. Population 13,301.

Clin'ton, De Witt, was born at Little Britain, N. Y., March 2, 1769. He was a son of Gen. James Clinton and a nephew of Gov. George Clinton. He graduated at Columbia College, and after studying law he entered politics as a Republican member of the lower house of the New York legislature in 1797, where he soon became the leader of his party in the state. He was chosen United States senator in 1802, and was at this time regarded as "the most rising man in the Union." But he left the senate to become mayor of New York city, an office of considerable power in those days, which he held for 11 years. On the question of war with England, he competed for the presidency with Madison, receiving 89 votes. He was elected governor of New York four times. His greatest service to the state was in urging the construction of the Erie Canal, and pushing the measure assiduously till he saw that great enterprise completed and the canal open for traffic. Clinton was dignified in manner, of fine personal appearance, deeply in earnest in all he undertook, energetic, capable and popular. His life-work is identified with the early growth of the state. He died at Albany, N. Y., Feb. 11, 1828.

Clinton, George, one of the prominent men of the Revolution, was born in Ulster County, New York, July 26, 1739. He had a careful schooling at home. As lieutenant of militia, he took part in the expedition against Fort Frontenac (Kingston), Canada. He entered law, but was chosen a member of the colonial assembly, where he soon became the head of the Whig party. In 1775 he became a member of the Continental Congress and voted for the Declaration of Independence; subsequently he was appointed brigadier-general. He was soon after chosen governor of New York, and was re-elected six times in succession. In the Revolutionary War it was due to him that communication was hindered between the British in Canada and those in

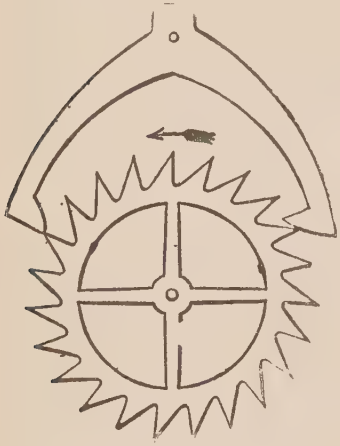
New York city. The number of Tories in the state made his position the most difficult to fill of any in the country, except that of Washington. When the time came to adopt the Constitution, Clinton opposed it, on the ground that it gave the general government too much power. In 1804 he was elected vice-president of the United States, on the ticket with Jefferson, and was re-elected in 1808. He died at Washington, D. C., April 20, 1812.

Clinton, Sir Henry, an English general, was born about 1738. He served in the Seven Years' War, and was sent to America as major-general in 1775. He took part in the battles of Bunker Hill and Long Island, and captured Fort Clinton on the Hudson. In 1778 he became commander-in-chief of the British land-forces. He was forced out of Philadelphia by Washington, captured Charleston in May, 1780, and sailed from New York with 7,000 men to relieve Cornwallis on the day he surrendered. He was superseded by Sir Guy Carleton in 1781. Later on, he was appointed governor of Gibraltar, where he died December 23, 1795.

Clive (*klīv*), **Robert, Lord,** founder of England's Indian empire, was born near Market-Drayton, England, Sept. 29, 1725. At school Robert was a much better fighter than a scholar. At 18 he went to India as a clerk of the East India Company, where, penniless and tired of the drudgery of his life, he attempted suicide, but his pistol snapped twice, and he decided to bear his trouble a while longer. When the French took Madras in 1746, Clive escaped in the night from the city, disguised as a Mohammedan, and made his way to Fort St. David. Now 21, he was commissioned as ensign in the military service of the company. India was at this period rapidly falling into the hands of the French, and the safety of the English trading-posts was gravely in peril. Clive, now 25, had gained a name for desperate courage as well as for military genius. Assuring his superiors that a move must be made at once on Arcot, he was intrusted with 200 British troops and 300 Sepoys. He seized Arcot without a blow, and with his little force, now reduced to 80 Englishmen and 120 Sepoys, he withstood a siege of 7,000 natives and 120 French soldiers for 11 weeks. Then, after a last assault, the siege was raised, and Clive, marching out, won two battles and captured two important forts. After two years spent in England, where he refused a diamond-hilted sword from the company until another was given to his superior officer, he came back to India in 1755 with the rank of lieutenant-colonel. A year later, with Admiral Watson, he sailed for Calcutta, to avenge the Black Hole massacre. Calcutta and other places were speedily taken from the barbarous nawab of Bengal, Surajah Dowlah, and at Plassey, June 23, 1757, Clive's 3,200 men, two thirds of whom were Sepoys, fought 50,000 natives, supported by 40 French guns. After eight hours' fighting, Clive won the decisive battle which fastened English rule upon Bengal. Mir Jaffir, one of the nawab's generals, had agreed before the battle to keep his forces inactive, for which he was to be made nawab. An unscrupulous go-between threatened to betray this agreement, and demanded from the British a large sum of money. Clive, however, overreached him by a false treaty, to which he forged Admiral Watson's name. When Plassey had been won, Mir Jaffir was at once declared nawab, and, leading Clive into the great treasury of Bengal, told him to help himself, which he did, taking over $1,000,000. These are the only two blots on his character. For three years Clive was ruler in all but name in Bengal, and was always called by the natives Sabat Jung, the daring warrior. In 1760 he returned to England, where he was welcomed by the great Pitt, as "a heaven-born general," was chosen member of Parliament, and made baron of Plassey. But by 1765 the affairs of the East India Company were in a bad way, owing to the rank dishonesty of its servants, and only Clive could set them right. As governor and commander-in-chief of Bengal, he set out a third time for India. At once he attacked the widespread abuses with vigor. At one time 200 officers of the army resigned, thinking to force him to submit by the sight of an army without leaders; but the Sepoys stood firm, and by issuing commissions for new officers, even to clerks, and by ordering every resigned officer to be brought to Calcutta he quelled all insubordination. But the energy with which he had cleaned that Augean stable had raised up a host of powerful enemies, who, after he had left India for good, stirred up Parliament to look into his early proceedings in Bengal. Attacked in regard to the fortune he had amassed, he described the glittering heaps on which he had gazed in the treasury of Bengal, and exclaimed: "Mr. Chairman, at this moment I stand astonished at my own moderation!" This storm of enmity broke his health and unhinged his mind, and opium did the rest. He died at London by his own hand, Nov. 22, 1774.

Clock. An ordinary clock is a machine for driving a wheel at the uniform rate of two revolutions a day. The energy for driving the machinery is stored up either in a raised weight or in a coiled spring. The uniformity of the motion is secured by use of a pendulum and an escapement. The clock in this form was invented by the great Dutch physicist Huygens in 1657. Galileo had already shown that the pendulum, when left to itself, performs its vibrations in equal times. Huygens showed how

the pendulum might be kept going and the advantage of its uniform vibrations thus be obtained. This he accomplished by the introduction of the escapement, a mechanism which is unlocked by the pendulum at each beat and thus allows the train of wheels to advance. But in addition to this the escapement also gives the pendulum a little push, which just makes up for the loss of energy which the pendulum sustains in swinging through the air and in unlocking the train.



ANCHOR ESCAPEMENT

The action of the escapement will be evident from the accompanying figure, in which the arrow indicates the direction in which the mechanism is driven by the spring or weight. In the upper part of the figure are represented the two pallets which receive alternate pushes to right and left as, one after another, the teeth of the wheel pass. A good clock of this type keeps better time than the sun; and accordingly we now use as our standard of time the period of revolution of a fictitious sun which revolves uniformly with the average speed of our actual sun. This is called mean solar time. The astronomer uses a clock in which the hour-hand rotates at the same rate at which the fixed stars appear to revolve about the earth. In other words, this instrument, which is called a sidereal clock, rotates at the same rate as the earth, which is the most uniform motion that we know anything about.

American clock-making from early days has had an interesting history, the men who have been connected with it being many and in their way characters, from Isaac Doolittle, in the old colonial times, who as a brass-founder built a bell-foundry and made brass wheel-clocks, to the era of the New Haven Clock Co., with its originators in Hiram Camp of Plymouth and Chauncey Jerome of Bristol, Conn. Interesting, too, is the story of Eli Terry, the father of wooden clock-making, as is that of the men who had to do with the New Haven concern—such as James E. English, H. M. Welch and Hiram Camp, the latter the inventor of a number of automatic tools and machines for making parts of clock-works, and perhaps the greatest of American clock-makers.

The chronometer is merely a spring-clock in which an oscillating wheel called the balance is employed instead of a pendulum. This wheel is lightly tethered by a fine spring called a hair-spring, and its value lies in the fact that its vibrations occupy equal times. In 1714 the British government offered a reward of $100,000 to any one who would devise a means for getting longitude at sea within 30 miles. Stimulated, perhaps, by this offer, John Harrison (1693–1776), an English mechanician, invented the chronometer, which enabled navigators even then to determine their longitude within 18 miles.

A watch is merely a small chronometer that can be carried in the pocket. A striking clock is one fitted with a bell which is struck by a hammer at certain equal intervals, generally an hour. It is this form of instrument from which we derive our word clock, which originally meant a bell. Driving-clocks are really engines operated by a spring or weight. Telescopes in observatories are made to follow the stars by means of such driving-clocks.

Time-keeping before the invention of clocks was a very crude process. During the day the ancients were dependent upon the position of the sun, and during the night upon the positions of certain well-known fixed stars. Intervals of time were measured by allowing sand or water to run through funnel-shaped vessels, called hour-glasses and clepsydræ respectively. See Sir E. Beckett's *Clocks, Watches and Bells;* Benson's *Time and Time-Tellers* and Britten's *Watch and Clock-Makers' Handbook.*

Close Pol'lina'tion (in plants), the transfer of pollen from the stamen to the stigma of the same flower. See POLLINATION.

Clouds are masses of water-vapor condensed into very minute drops of water or frozen into very small particles of ice. Every one is familiar with fogs. Clouds are simply fogs formed at a considerable distance above the earth. They are generally white in appearance for the same reason that any transparent substance, such as glass or sugar, is white when broken up into small particles.

The classification of clouds generally employed is the one which divides them according to their external appearance into four different groups:

1. The *cirrus* or mare's tails clouds are composed of long white fibers or slender filaments. They are generally observed at great heights, and are probably composed of small crystals of ice. Glaisher in his balloon-ascents found cirrus clouds above him even at the height of 23,000 feet; while, on the other hand, cirrus clouds are

never seen below the summit of Mt. Blanc, which is nearly 16,000 feet in elevation.

2. *Cumulus* clouds are those which look like great mountains of cotton piled one on top of another and resting on a horizontal base. It is highly probable that the rounded top of these clouds results from columns of hot, moist air rising and thrusting their tops into the upper and hence cooler regions of the atmosphere.

3. *Stratus* clouds consist of large flat layers or horizontal sheets. They are seen very frequently about sunset.

4. The *nimbus* or rain cloud has no particular form, but generally is large and gray or dark.

Regarding the causes which operate to produce clouds, we may group them all under one general head, *namely*, a lowering of the temperature of the air below the dew-point. Among the particular causes which produce this fall of temperature are the following:

(*a*) Radiation of heat from the earth to space, especially at night. This is the most frequent cause of fogs on land. (*b*) Radiation from the earth's atmosphere to space (*c*) Expansion of heated air on rising to higher regions of the earth's atmosphere where the pressure is less. (*d*) A cold wind blowing into a region filled with warm, moist air.

Another condition necessary for the formation of clouds is the presence in the air of small dust-particles or of ions. This fact has been demonstrated mathematically by Kelvin and experimentally by Aiken. In reply to the frequent query as to why the clouds do not fall, it is to be said, *first*, that they may be falling when in quiet air, but, *secondly*, when particles are as small as those involved in the case of clouds, their surface becomes enormously large compared with their mass; so that the resistance which the air offers to a falling body of this size is also enormous when compared with its weight. Hence the rate of fall is, in general, so minute as to escape observation.

Clo'ver, species of the genus *Trifolium*, belonging to the pea family. The name is chiefly applied to those species which are used in agriculture. It is also sometimes applied to species of other genera in the same family, as the sweet clover, which is *Melilotus;* prairie clover, which is *Petalostemon*, etc. About 300 species of *Trifolium* have been described, and they are well-known by their habit and three-foliolate leaves. The common red clover (*T. pratense*) is probably not native to North America, but has come from Europe. The white clover (*T. repens*) has been introduced from Europe, but is also probably native to North America. Numerous native species belong to North America, especially in the far west

Cloves. See SPICES

Clo'vis, king of the Franks, was born 465 A D., and died in 511. He conquered the Gallo-Romans, and overran the whole country between the Somme and the Loire. His wife, Clotilda, was a Christian, and earnestly wished her husband to become a Christian also. In a great battle with the Alemanni Clovis was hard pressed, and at last in despair cried to the God of Clotilda, offering to become a Christian if he got the victory. The Alemanni were driven from the field and on Christmas day Clovis and his soldiers were baptized; while he received from the pope the title of Most Christian King.

Clyde, the most important river of Scotland It flows for 106 miles, past Lanark, Bothwell and Glasgow, the head of navigation, and at Dumbarton becomes a firth. Near Lanark are the four famous Clyde falls. Below Glasgow large sums have been spent in deepening the channel, so that the former depth of 15 inches at low water has now become from 18 to 20 feet. The first steamboat in Europe was launched on the Clyde in 1812. The last 14 miles of the river, together with the firth, which slowly widens from one to 37 miles, are one of the world's chief commercial waterways. There is a very large amount of shipbuilding on the Clyde.

Clytemnestra. See AGAMEMNON.

Coal, a name applied to considerable aggregations of carbonaceous matter of vegetable origin Coal has no definite chemical composition, the proportion of carbon varying from 95 per cent. or even more down to 70 per cent. or a little below. Coal occurs in beds interstratified with shale, sandstone, etc. The vegetation from which coal was made is believed to have grown where the coal now occurs. At the time of the growth of the vegetation, the regions where it grew are believed to have been swamps comparable, except in size, to the peat-bogs of the present time. As the vegetation growing in the bogs died, it fell into the water of the swamps, as in the case of the Dismal Swamp of the present time. Beneath the water the dead vegetation did not decay as it would have done in the open air, though it underwent chemical changes. The first series of changes resulted in its transformation into peat. After the accumulation of considerable beds of vegetable matter in the swamps, the sites of the swamps seem to have been submerged, probably by sinking. When submerged, either beneath the sea or beneath the waters of lakes, sediment, such as sand or mud, was deposited over the accumulated vegetable matter. Thus buried, the vegetable matter was still more completely shut off from the air and underwent further chemical changes. At the same time the weight of the sediment above

the accumulated vegetation compressed it into more and more compact form. As the result of the chemical changes and the compression, the vegetable matter was gradually brought to the condition of coal.

In many regions there are numerous seams or beds of coal, one above another, separated by beds of shale, sandstone, etc. Each bed of coal represents the succession of conditions sketched above. After the burial of one body of vegetable matter the area was perhaps elevated sufficiently to cause it to become a marsh again, and the growth of vegetation followed. This in turn was buried.

Wood contains about 50 per cent. of carbon. In the chemical changes which it undergoes in peat-bogs, it loses some of the carbon, but still more of its oxygen and hydrogen, so that the proportion of carbon remaining after the changes is greater than before. Peat contains about 60 per cent. of carbon. With the loss of more hydrogen and oxygen, and with compression which renders it solid, peat is transformed into coal When the changes have gone so far that the proportion of carbon is as great as 90 per cent., the coal is anthracite. When the proportion of carbon is less, the coal is said to be bituminous or soft. Of bituminous coal there are many grades, depending partly upon the proportion of carbon. The chemical changes in the vegetable matter may go so far that the proportion of volatile matter (hydrogen and oxygen) is reduced to one or two per cent. In this condition the coal is said to be graphitic. Graphitic coal does not burn readily. Anthracite coal, which contains relatively little volatile matter, burns with little flame. Bituminous coal, which contains more volatile matter, burns with flame, and in general burns more readily as the proportion of volatile matter increases. There are several varieties of bituminous coal, named according to their uses. Among them are coking-coal, furnace-coal, cannel-coal, etc. Coking-coal melts on becoming hot, and after the volatile matter escapes the solid product is coke. It has much the composition of anthracite coal, but is spongy in texture. Cannel-coal is impure, and contains much volatile matter. It is rather earthy in texture, and less hard than most other varieties of coal. It is extensively used for burning in grates. Furnace-coal is any sort of bituminous coal appropriate for use in furnaces.

Anthracite coal occurs mainly in regions of folded strata, where the folds have been greatly eroded. The compression to which the coal was subject in the process of folding, the heat generated by the compression and the subsequent exposure of the coal-beds after erosion, allowing the volatile matter to escape, have probably been the chief factors in the transformation of soft coal into anthracite. In some places in New Mexico and Colorado soft coal has been changed into anthracite by contact with lava. Bituminous coal, as may be inferred from the above, usually occurs in regions where the strata are horizontal or but slightly tilted.

The coal of the United States belongs partly to the carboniferous system (see GEOLOGY) and partly to the systems of later periods, especially to the last part of the cretaceous. There is a little coal in the triassic system of the east (Virginia and North Carolina), and very considerable quantities of coal in the tertiary of the west, especially in Washington.

The coal product of the leading coal producing countries is as follows:

United States	501,596,378	metric ton
Great Britain	296,007,699	" "
Germany	245,043,120	" "
Austro-Hungary (1909)	54,573,788	" "
France	42,516,232	" "
Belgium	26,374,986	" "
Russia and Finland	24,967,095	" "
Japan (1909)	16,505,418	" "

The total product of all other countries was probably not more than 40,000,000 tons.

The United States coal-fields of the carboniferous period are as follows:

1. New England field (Rhode Island and Massachusetts—coal more or less graphitic and little used).

2. The Appalachian coal-field, including the coal-producing areas of Pennsylvania, eastern Ohio, Maryland, Virginia, West Virginia, eastern Kentucky and Tennessee, Georgia and Alabama; area, 58,695 square miles.

3. Northern coal-field, part of southern Michigan, 6,700 square miles.

4. The central coal-fields, including the coal-producing areas of Indiana, Illinois and western Kentucky, 47,250 square miles.

5. The western coal-field, including the coal-producing areas of Iowa, Missouri, Nebraska, Kansas, Arkansas, Oklahoma and Texas, 98,700 square miles.

Coal-formations of cretaceous age occur in Dakota, Montana, Wyoming, Utah, Colorado and New Mexico. Coal-formations of tertiary age occur in Washington, Oregon, California and Alaska, but especially in Washington, where the amount of coal is large. The area of the cretaceous coal-fields is probably as great as that of the carboniferous coal-fields. The area of the tertiary coal-fields is not known. The amount of coal in these western fields has not been estimated. It perhaps equals that in the carboniferous system, though the quality of the coal is on the whole inferior.

The anthracite coal of the United States is derived chiefly from Pennsylvania. Colorado and New Mexico, however, produce some. Pennsylvania also leads in the pro-

duction of soft coal. Named in the order of their gross product in 1910, the chief coal-producing states are as follows:

Pennsylvania 225,954,772 (of which 75,433,246 were anthracite); West Virginia 61,671,019 Illinois 45,900,246; Ohio 34,209,668; Indiana 18,389,815; Alabama 16,111,462. The states which produced from fifteen to one million down, in order named, were Kentucky 14,623,319; Colorado 11,973,736 (a part being anthracite); Iowa 7,928,120; Wyoming 7,553,088; Tennessee 7,121,380; Maryland 5,217,125; Kansas 4,921,451; Washington 3,911,899; New Mexico 3,508,321 (anthracite about 20,000); Missouri 2,982,433; Montana 2,920,970; Oklahoma 2,646,226; Utah 2,517,809; Arkansas 1,905,958; Texas 1,892,176; and Michigan 1,534,967. States producing less than one million tons were North Dakota (399,041); Georgia (177,245); Oregon (67,533); California (11,164); and Idaho (4,448). For the fifth time in the history of the United States the production of coal reached in 1910 a total of over 400,000,000 short tons. The bituminous production was 417,111,142 short tons, and the anthracite 75,433,246 long tons. Their value was $629,557,021, showing a considerable increase over the value of the output for 1909 which amounted to $554,668,334.

The chief coal-producing countries outside of the United States are those mentioned in the general table. To this list should perhaps be added India, Nova Scotia and Spain. R. D. SALISBURY.

Coast-Defense. In 1885 the nation awoke to the fact that the fortifications that should protect our cities and prevent a foe from using our harbors as bases of warlike operations were absurdly weak—in many cases not strong enough to keep out a single line of battleships. Our navy had just been born, and we were without torpedo or other coast-defense vessels. In 1886 about 100 million dollars were appropriated to be spent in 10 years for coast defense; but for many years the matter was greatly neglected. To-day, however, it is believed that our principal ports and harbors are safe from any attack from the sea, even if our navy were driven from the ocean. The defences on the great lakes are comparatively weak, as our treaties with Great Britain prevent either country from maintaining more than a few small vessels upon these waters. The first plans for coast-defense relied largely on vessels of great gun-power and lying very low in the water, so as to offer a small target. These ships were expected to remain in the harbor to supplement the forts. But this type of harbor-defense is abandoned. The coast-defense forts are to all appearance nothing but grassy mounds of earth. The guns for the most part are of the disappearing type, presenting a target to the enemy only at the moment of firing. The latest form of coast-defense is the submarine ship of which we already have a few excellent examples.

Coast Range, a mountain range in California, extending from the Oregon boundary into Lower California. It is 30 to 40 miles wide, and is divided by the Bay of San Francisco. From the main range spurs reach out to the coast line, inclosing fertile valleys. The most noted are the Los Angeles, Santa Clara and Sonoma valleys. The highest peak is Mt. San Bernardino, 11,600 feet in height.

Coast-Survey, of the United States, is an undertaking of great importance. With a long and dangerous seacoast; with thousands of vessels yearly entering and leaving our ports; and with a great coasting trade, it is the duty of the nation to provide every means which science and skill can offer for pointing out the dangers of the coast. The coast-survey was founded for these objects. It furnishes accurate maps of the whole coast, including Alaska; it points out the site of, or suitable places for, lighthouses and beacons; it traces the ocean-currents along the shores; it studies the tides; it finds out the courses of the winds, the changes which take place at the entrance to harbors, the character of the bottom of the sea off the coast, etc. The first suggestion in the way of organizing a coast-survey was made in Jefferson's message to Congress in 1807; but work was not commenced until 1817. The large scope of the work, its accuracy, the quickness and cheapness with which results have been reached—taking much less time and costing much less than the British survey—have been largely due to its long-time superintendent, the late Prof. A. D. Bache. Besides the valuable scientific knowledge gained, many discoveries of great value to commerce have been made. Thus the entrance to Delaware Bay was found to be eight miles in error. Six dangerous shoals were found in one year near Nantucket, right in the track of trans-Atlantic ships and of the heavy coast-trade between the eastern and the southern states. A new channel, with two more feet of water than any other, was discovered in New York harbor. The reports on the tides and the Gulf Stream were also of the greatest value to commerce.

Co'balt. This chemical element has an atomic weight of 59. Its symbol is Co. It is a metal, very tenacious, but not commercially valuable except as the basis of certain brilliant paints, sometimes referred to as cobalt green and cobalt blue. It is often used to color glass blue and in the making of blue porcelains, etc. These colors are derived from the oxides of cobalt. The chloride of cobalt may be used as a sympathetic ink, *i.e.*, an ink which can be made to appear or disappear; for, when

kept moist, the chloride remains invisible; but when dried before a fire, it quickly appears as blue ink. The metal is found pure in meteorites, but otherwise is found only in compounds, usually with arsenic or sulphur. It is not abundant, though widely distributed.

Cobalt, a noted mining center in the district of Nipissing, Ontario, Canada, lying just south of the arable lands of Lake Temiscaming. Discovered in 1904, it now has 25 producing and shipping mines, the owners of which have become very wealthy men. In 1904 the camp (largely in the one township of Coleman) produced 158 tons (silver) valued at $136,217; in 1905, 2144 tons valued at $1,473,196; in 1906, 5129 tons valued at $3,900,000. Over 14,000 tons were shipped in 1907 valued at $9,500,000. It is believed that the value of the shipments for 1908 will exceed $10,000,000. The mines are only beginning to be worked in a methodical, scientific way. The Nipissing, the O'Brien, the La Rose and the Coniagas are especially noted for their richness and extent. The district produces other valuable minerals besides silver, including cobalt, nickel and arsenic. Cobalt (the mineral which gives the town its name) is a comparatively rare mineral, used chiefly for coloring glass and fine china and pottery, but also for making paints and pigments. A greater variety of rare minerals has, it is said, been found in the broken reef that runs west from the St. Lawrence than in any other region in the world. Cobalt is 330 miles from Toronto, and is reached by the Grand Trunk Railway via North Bay. From five small veins which have been quite recently opened in an area less than a mile in length and half a mile in breadth, surrounding Cobalt station on the Temiscaming and Northern Ontario Railway, four hundred thousand dollars' worth of ore has been shipped. The records of this railway show 4663 tons of rich ore shipped in 1907. And this wonderful district is only on the threshold of development. In conjunction with the rich finds of silver ore there are found cobalt, nickel and arsenic.

Cobb, Howell, born in Georgia in 1815, became a lawyer, and was member of Congress from 1843 to 1851. In 1849 after a debate that lasted three weeks, he was elected speaker. This was a victory for the southern party, that sought to introduce slavery into California, which had been ceded by Mexico to the United States and was about to enter the Union as a state. In 1851 Cobb became governor of Georgia. He presided over the Congress that adopted the Confederate constitution, and on the outbreak of war he became major-general in the army of the south. After peace was declared, he bitterly opposed the policy of reconstruction until his death in 1868.

Cobbe, Frances Power, an English reformer, philanthropist and author, was born in Ireland, Dec. 4, 1822. Early in life she devoted herself to relief-work among women and to various reforms, by addresses, lectures and articles in the newspaper and periodical press. She has actively opposed vivisection, and for 18 years was honorary secretary of a society for the protection of animals from vivisection. She has also been a zealous worker in educational and philanthropic projects, and written extensively, from a Unitarian point of view tinged with rationalism, on theistic ethics and belief. Her chief writings embrace *Studies, Ethical and Social; Intuitive Morals; Religious Duty; Hopes of the Human Race; Duties of Women; Darwinism in Morals; A Faithless World; The Scientific Spirit of the Age;* etc. Her autobiography appeared in 1894, and her death occurred in 1904.

Cob'den, Richard, "the apostle of free trade," was born at Heyshott, England, June 3, 1804. After five miserable years in a "Dotheboys school," he was given a position in his uncle's wholesale warehouse in London. After setting up for himself in the calico-printing business, he settled at Manchester in 1832. He was an energetic member of the Manchester Anti-Corn Law League, which opposed all duties on corn [wheat] Becoming a member of Parliament, his speeches in the house and lectures throughout the country had great effect in bringing about the repeal of the corn-laws in 1846. In politics he was against the Crimean War, declined to serve under Palmerston as president of the board of trade, and arranged the treaty of commerce with France in 1860. Throughout his life he was earnest and simple-minded. In Parliament he was the master of clear, persuasive speech, and was the champion of free trade, peace, non-intervention and economy. He died on April 2, 1865.

Coblenz or **Koblenz** (*kō'blĕnts*), a city of Prussia, at the junction of the Rhine and the Moselle. It is strongly fortified by a wall and a series of forts, especially the castle Ehrenbreitstein, which was built by Emperor Julian and is deemed almost unassailable. The defensive works will shelter 100,000 men, though 5,000 are deemed enough to defend them. The magazines are designed to hold provisions for 8,000 men for ten years, and the cisterns to hold a three years' supply of water. The old church of St. Castor, built in 836, and its palace are the chief features of the city. Its main trade is in champagne and cigars. Coblenz became a part of Prussia in 1815. Population, 53,897.

Cobourg (*kō'bōōrg*), a favorite summer resort, 70 miles east of Toronto on Lake Ontario. Population, 5,000. Some beautiful homes have been erected by wealthy Americans who spend the summer there.

Its public buildings, churches, banks, schools and hotels are unusually attractive. It is the best harbor on the north shore of Lake Ontario. The Grand Trunk Railway has a daily ferry-service to Rochester, New York.

Cobra de Capello (*kō'brà dà kà-pĕl'lō*), the hooded snake of India, the most dreaded of the serpent tribe. Its poison fangs stand out, not like those of the rattlesnake at the time of striking, but permanently. There is a more venomous snake in India, but the cobra is more abundant and is extremely poisonous. About 25,000 deaths occur annually in the Indian peninsula from cobra bites. Its usual food is small reptiles, frogs, fish, etc., and it may climb to roofs or among branches or take to the water in search of food. Its natural enemies are the jungle-fowl, which devours the young, and the ichneumon, which can overcome the full-grown animals. When excited, the hood (see illustration) is expanded by dilating the neck. The colors of this serpent vary from brownish olive to black, with white or black spots (usually two) on the hood. The natives hold it in superstitious reverence, and it is a favorite with the snake-charmers of India.

COBRA

Cochin-China (*kō'chĭn chĭ'nà*), the maritime region of Anam, an Asiatic possession (since 1861) of France, lies along the east coast of Indo-China, washed by the China Sea. The area of the whole of the Indo-Chinese dependencies of France is about 255,000 square miles, with a population of 18 1-4 millions. It is divided into four main parts: Tonquin in the north, south of it Anam proper, south of Anam, Cochin-China proper, and in the far southeast, Champa. The capital is Hué. The delta-lands of Tonquin are very fertile, yielding two harvests a year. They are formed by the red soil carried down by the main river of the country, the Song-coi, which is rapidly enlarging the delta. Hanoi, a seaport built by the Chinese in the 18th century, is now 100 miles inland. Everywhere the delta-lands are crossed by deep dikes, many miles in length, from 20 to 30 feet high, and broad enough at the top for three carriages to drive abreast. The people of the hills are taller and stronger than those of the coast, who are small and so inactive that "lazy as an Anamese" has become a proverb. The great crop is rice, which is also the main food, though the people are fond of snakes, locusts, rats and dogs. The emperor is a despot, and the bastinado, mutilation and torture are regular punishments. All men between 18 and 60 must serve in the army, and the field-work is usually left to the women.

Cochin-China, which has an area of 23,160 square miles, was conquered by China in 214 B. C., gained its independence in 929 A. D., and was successful in a second war with China in 1403–28. In 1517 came the Portuguese, and soon after the Dutch; in 1789 appeared the French, who have slowly made themselves masters, so that now the whole country is a dependency of France. The capital is Saigon, and the chief products are rice, cotton, silk, hides, fish, pepper and copra. Population is about 2,226,935, and the population of Saigon the capital is 47,577. See ANAM and CAMBODIA.

Cochineal. A dyestuff, made from the cochineal insect, scarlet or crimson in color. From the same source are derived the carmine and lake paints or pigments. Of late years this coloring matter is of less importance, because of the use of aniline dyes which are prepared cheaply by chemicals from coal-tar. The home of the insect is Mexico and Central America. It is very small, a pound of cochineal containing about 70,000 dried insects. It feeds on the cactus, and is secured by taking branches of that plant and giving the females an opportunity to lay their eggs. These little eggs are hatched in enormous numbers, and when this second generation of insects is just ready to lay the little creatures are gathered in trays and placed in a hot oven. They are later dried thoroughly in the sun. From the dead bodies 10% of pure dye is secured. The insect has been successfully introduced into Java and Australia.

Cockatoo, any member of a family of parrot-like birds inhabiting the East Indian archipelago, Guinea and Australia. There is in most species a crown of feathers on the head, which are raised when the bird is excited, but quite smooth when it is quiet. The birds live in flocks in the tops of tall trees, and make a note sounding like their name, but they are also great screamers. They are very common in zoological gardens. The prevailing color of plumage is white, but there are a yellow-crested and a pink

LEADBEATER'S COCKATOO

crested cockatoo, the latter with feathers pink above and almost crimson below. There is also a black cockatoo.

Cock'rell, Francis Marion, a member of the U. S. senate, was born in Johnson County, Missouri, in 1834. He practised law, served in the Confederate army during the Civil War, and attained the rank of brigadier-general. As a senator he was quite prominent upon committees dealing with appropriations, military affairs and industrial expositions. He was appointed on the inter-state commerce commission in 1905. He died in 1915.

Cockroaches. The cockroach or roach is a member of the order *Orthoptera* or straight-winged insects, and is thus closely related to locusts, grasshoppers and crickets, rather than to beetles. Fossil roaches are found in such numbers in the lower coal-beds as to suggest that they were the most common insects during that warm moist period of the earth's history. They still follow warmth and moisture, and for this reason have attached themselves to man. There are four species that especially infest our houses, the German, the American, the Oriental and the Australian.

They are smooth, brownish insects, broad and very flat-bodied, which enables them to spend the day between boards or otherwise hidden. The head is bent under the body, and the eyes turn downward. The antennæ or feelers take the place of noses and ears, apparently, and are very long, about the length of the body and very slender, having 100 or more joints. The males commonly have two pairs of wings. The female commonly has shorter wings or none at all. They come out to feast by night. So greedy are they that they have been known to bite through book covers and gilt lettering so as to get at the paste beneath. They leave an offensive odor on all over which they pass, and even flavor dishes so that the odor becomes perceptible only when the food cooked therein is tasted.

Though roaches are excellent scavengers and are reputed to destroy bed-bugs, they are so disgusting that it is important to unite in their destruction. They will invade a house which is free from them, so that concerted action is necessary. They are on their guard against most poisons, but can to a great extent be destroyed by the use of pyrethrum powder. This, however, spoils the shelves on which it is placed, and the roaches are only paralyzed by it in many cases, and must be swept up and burnt in the morning, before they recover. Phosphorus paste, of which many preparations are sold under patents, is destructive to roaches, but is troublesome and not free from danger. Wherever a room can be made airtight, *fumigation* by burning pyrethrum is very effective.

Co'coa, a substance obtained from the seeds of *Theobroma Cacao*, a member of the *Sterculia* family. This particular species is native to tropical America. The cucumber-like fruit contains numerous seeds which are called cocoa beans. From these beans the cocoa is obtained, and in its refinement it appears in commerce under the name of chocolate.

Co'coanut, a species of the genus *Cocos* (*C. nucifera*), belonging to the palm family. It is native to certain islands of the Indian Ocean, growing naturally on the sea-shore or in its immediate vicinity, but cocoanut plantations are common throughout the tropics. A tough fibrous husk incloses the nut, whose hard shell is lined with the food-material. The so-called milk in the large cavity is simply tissue which has not developed into compact cells. Not only is the fruit itself an article of commerce, but the oil extracted from the nuts, which is known as cocoa-

COCOANUT PALM WITH FRUIT

butter. This is one of the tallest and most ornamental of the palms, the columnar trunk sometimes rising to a height of 100 feet and being crowned by a cluster of leaves from 10 to 20 feet long. As a rule it is found near the sea-coast. The tree begins to bear fruit when about eight years old; the average annual yield is from 90 to 100 nuts; and the tree remains productive many years. The embryo finds outlet in the largest of the three black scars at one end of the shell. The cocoanut is propagated only by seeds.

Cocoon (*ko-kōōn'*). See CATERPILLAR.

Cod, a common salt-water food-fish related to the haddock. The average weight of those taken about Cape Cod is about ten pounds, but they may reach the exceptional weight of one hundred and sixty pounds. One weighing 60 pounds is considered a large fish. They live in the cold waters of the north-temperate seas, and extend into the Arctic Circle. They are remarkable eaters; not only do they eat very many fish, but they swallow shelled mollusks whole, and rare shells have been collected from the cod's stomach. They

Courtesy of Bulletin of Pan American Union

A COFFEE PLANTATION IN COSTA RICA.

Showing trees twenty-five feet in height. In most large plantations they are allowed to grow not more than ten feet high The broad leaves here seen are those of a banana tree.

Courtesy of Bulletin of Pan American Union

YOUNG COFFEE TREES IN BLOOM.

The blossoms are something like the jessamine in form and scent. The blossoms last only about three days. The rich fragrance can be detected by incoming voyagers three miles from land. The coffee trees begin to bear two to four years after they are transplanted from the nursery.

Courtesy of Bulletin of Pan American Union

A COFFEE PLANTATION IN BRAZIL.

In the single state of São Paulo, Brazil, there are growing 700 million coffee trees, producing annually about three-quarters of the world's coffee crop Miles and miles of coffee trees stretch away as far as the eye can reach.

Courtesy of Bulletin of Pan American Union

NEAR VIEW OF COFFEE TREE SHOWING FRUIT

When ripe the fruit is red, and looks something like a cranberry. The coffee we buy is the seed of this berry. There are usually two seeds in a berry. Under the outer skin is a sticky pulp which incloses the seeds or beans, and these beans are coated with a coarse husk called "parchment," and under this is a very thin jacket known as the "silver-skin.'

Courtesy of Bulletin of Pan American Union

PICKING COFFEE IN BRAZIL.

The berries are stripped from the boughs by hand and, with many leaves and twigs, let fall to the ground. Then they are raked together the leaves and twigs separated, and the berries packed in sacks. After being washed clean the berries are carried in water to the pulping machine which crushes and loosens the pulp. The wet mass of beans and pulp then passes through a perforated revolving cylinder which separates the beans from the pulp This is what is called the "wet system."

Courtesy of Bulletin of Pan American Union

DRYING GROUNDS.

After passing into a fermentation basin, where any bit of pulp remaining is loosened and washed out, the beans are carried to the drying grounds. These are paved with brick or tile on which the beans are spread. Here constant watch and care are required, the beans being stirred to give uniform heat and ventilation, so that they do not dry too rapidly or too slowly.

Courtesy of Bulletin of Pan American Union

CLEANSING.

When dry the beans are taken to the machine for cleaning and hulling. A blower carries off the dust; then in the hulling machine the beans pass between corrugated surfaces, where by friction the inner coverings are loosened, and a second blower throws out the hulls and dust. By machinery the beans are then sorted as to size and weight, and from the last machine they fall into bags for shipment

Courtesy of Bulletin of Pan American Union

PREPARING FOR SHIPMENT.

This is a scene in a shipping warehouse in the port of Santos, Brazil. The coffee is being weighed and made ready for loading on the steamers for shipment to Europe and the United States. For miles the docks of Santos are lined with steamers, flying the flags of many nations, all waiting to load coffee.

lay an immense number of eggs—as many as 9,000,000 from a 75-pound fish. The cod are caught with hook and line, and great numbers are salted as food. Cod-liver oil is a well-known medicine.

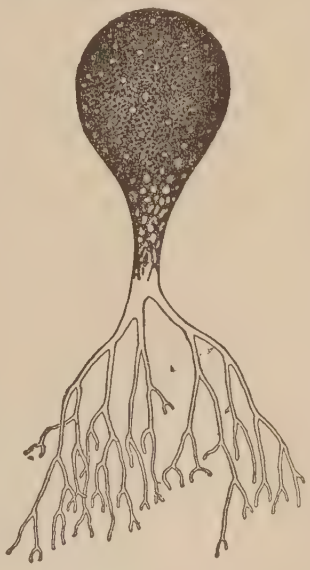
Codlin-Moth (*Carpocapsa pomonella* of Linnæus), according to Comstock "the best known and probably the most important insect-enemy of the fruit-grower," is gray with bronze markings, and has a wing-spread of less than an inch across. The eggs are laid in the middle of the blossom, and hatch into tiny maggots, which eat to the center of the young apple. When the apple drops, as it does prematurely, the grown larva crawls out and into the ground. Later it spins its cocoon under the scales of the bark of the apple-trees. Large numbers are destroyed while in this stage by woodpeckers. The larvæ of the second brood are carried late in the fall to where apples are stored for the winter, and live to the next spring. It is estimated that this moth causes $7,000,000 damage yearly in Illinois, Nebraska and New York. Preventive: Paris green or lead arsenate sprayed on the trees just as the blossoms fall, with a repetition of the treatment in a few days if rainy weather follows. (See SPRAYING.)

Cody, William Frederick, an American frontiersman and scout, was born in Iowa, Feb. 26, 1846. He was familiarly known as Buffalo Bill, having earned the sobriquet by having killed, in 18 months (1867-8), over 4,000 buffaloes on the plains, to feed the laborers engaged in the construction of the Kansas Pacific Railroad. He for some time in 1868-72 acted as government scout and guide, and served in the field-operations against the Sioux and Cheyennes. In the battle of Indian Creek he killed Yellow Hand, the Cheyenne chief, in a hand-to-hand fight; and was also in the battle of Wounded Knee. In 1872 he was a member of the Nebraska legislature. In 1888 he organized what was known as the Wild-West Show, an exhibition of Indians, rough-riders, cow-boys and frontiersmen, with whom he made tours of the chief towns of the United States and Europe. He is a joint author of *The Great Salt Lake Trail.* He died Jan. 10, 1917.

W. F. CODY

Cœlenterata (*sē-len'ter-ā' tā*), the subkingdom of animals containing the hydra, sea-anemone, jelly-fish and coral animals. With the exception of the fresh-water hydra and a rare jelly-fish, they all inhabit salt water. There are several types of animals embraced within this subkingdom. The hydroids are colonial and branching. They have often been collected and pressed under the name of sea-moss. The polyps or individuals living on the branches are of two kinds: the feeding and the medusoids. The latter are modified polyps. When mature, they resemble jelly-fish and are set free, swimming about independently. They bear the eggs and sperms. When the eggs develop, they are converted into the branched colonial forms and as a consequence, there is an alternation of generations. The medusoids lead naturally to the jelly-fish, which are free swimming and of diversified form. Many of them have an umbrella-shaped disc with tentacles and other structures hanging from it. Formerly they were called medusæ. The coral-animals are both solitary and colonial or branching. All of these animals have lasso-cells, containing minute darts or threads which are capable of being discharged. In some forms they are long enough to penetrate the human skin, and these can inflict severe stings. The *Ctenophora* or comb-bearers make a separate class. See CORAL, HYDRA, JELLY-FISH,

Cœnocyte (*sē'no-sīt*), a plant body which contains no dividing walls, but consists of a single body cavity surrounded by the general bounding wall. Such bodies contain numerous nuclei, and may be regarded as being composed of just as many cells, which have not formed walls about themselves. The cœnocytic body is chiefly displayed by the siphon forms among the green algæ and by the *Phycomycetes* among the *Fungi.*



BOTRYDIUM, SHOWING A CŒNOCYTIC BODY

Coffee, the seed of the coffee-tree and also a well-known drink made from the same. The coffee-tree is a native of Abyssinia, Arabia and many parts of Africa.

It is extensively grown in Brazil and other northern states of the South American continent, as also in Mexico, Central America, Haiti, San Domingo and the East Indies. In a wild state it is a slender tree from 15 to 25 feet in height. When grown in plantations, it is not allowed to become more than six to ten feet high, with many branches. The fruit is dark scarlet when ripe, with two cells, having one seed each. The leaves are evergreen, and the flowers white. The coffee-tree thrives best in warm, moist lands; though it grows at Quito, Peru, at an altitude of 1,000 feet, where there never is any frost. The tree yields its first crop in the third year; from a full-grown tree, its yield may amount to a pound of coffee-beans. Three gatherings are made in the year, when this process takes place: The beans are placed on a mat to dry by the sun's rays; the pulp and skin are taken off by rollers; and the coffee is cleaned by winnowing. The main difference in price and quality of the product is due to care bestowed in preparing it in different places. The chief kinds are Mocha, a small, grayish-green bean; Java, a large, yellow bean; Jamaica, smaller and greenish; Rio, pale-yellow and whitish. Rio and Maracaibo are the cheaper, and Java, Mocha and Sunda are the more expensive brands. Coffee allays hunger, exhilarates and refreshes. According to some authorities it also lessens the amount of wear and tear of tissue in the waste in the animal frame which is going on every moment. The consumption of coffee in the United States in 1910 was 873,983,689 pounds, an average of 9.33 pounds *per capita*, and the average import-price per pound was 7.9 cents. More than half the world's coffee is produced in Brazil.

COFFEE-PLANT

Coffee Republic. See COSTA RICA.

Coffer-Dam is a temporary dam built around a place to be excavated for a foundation, so that the water can be kept pumped out. It is commonly constructed by driving piles about the given area and using sheathing of various kinds to make a water-tight wall. Coffer-dams are not ordinarily used in water over 25 feet deep. For deeper water caissons are used. See CAISSON.

Cohoes (*kō-hōz'*), a flourishing, manufacturing city in New York state, on the Hudson, at the mouth of the Mohawk, and also on the State Barge Canal. It has six large cotton-mills, and some 30 knitting-mills with a number of other factories. Population, 24,709.

Coin and **Coinage.** See MINT.

Coke, a fuel got by heating coal in confined places. This is done sometimes in heaps, just as charcoal is made from wood, but oftener in ovens. It is also made when coal-gas is manufactured, being left after the gas is driven off. Coke is a hard, brittle, porous solid, with a steel-gray glint, and it does not readily soil the hands when handled. It is mainly valued for the great heat it gives off and its freedom from smoke when burning. Moreover, it does not become pasty in the fire while some of the sulphur of the coal is driven off; all these qualities make it very useful in smelting and refining metals. Coal yields about 70 per cent. of coke.

Colbert (*kōl'bâr'*), **Jean Baptiste,** one of the greatest of French statesmen, was born at Rheims, France, in 1619. In 1651 he entered the service of the great minister Mazarin. On his deathbed Mazarin warmly recommended Colbert to Louis XIV. "I owe you everything," said he, "but I pay my debt to your majesty by giving you Colbert." It was in 1661 that Colbert became chief minister to Louis XIV. He at once began to improve the ruinous condition of the finances. So thorough was the change which he brought about, that in ten years the yearly revenue (net) was 77,000,000 livres, when before it had been only 32,000,000 livres. But his reforms did not stop here. Farming, business, roads, canals and French colonies all felt his energetic hand. He found France with a few old rotten ships, and in a few years provided her with one of the strongest navies in the world. He also was a friend to all men of learning. In short, Colbert was the patron of industry, commerce, art, science and literature, the founder of a new epoch in France. His aim was to raise the power of France; but all he accomplished was undone by the wars of Louis and his spendthrift court. He died at Paris in 1683.

Col'borne, Sir John, born in England in 1788, was educated at Christ's Hospital (the Bluecoat School) and Winchester College. He entered the army in 1794 and saw active service in Egypt, Sicily, Portugal and elsewhere. In 1828 he was appointed lieutenant-governor of Upper Canada (now Ontario). Greatly interested in education, he founded Upper Canada College which has for many years been one of the most important educational institutions in Canada. Owing to the agitation by William Lyon Mackenzie his term of office was one of stress and storm. He later became administrator of Lower Canada and suppressed the Papineau rebellion. He was subsequently made governor of the Ionian Islands, and later attained the highest military rank, that of Field-Marshal. As Lord Seaton he died in England in 1863.

1—Coffee Branch, showing Fruit and Blossom. 2—Single Blossom. 3—Fruit. 4—Cut Fruit. 5—Tea Branch showing Blossoms. 6—Fruit. 7—Cocoa Branch, showing Fruit. 8—Opened Fruit. 9—Blossom. 10—Hops, Male Plant. 11—Male Blossom. 12—Female Plant. 13—Fruit. 14—Minute Grains (greatly enlarged) at base of petals. 15—Catkin of Female Flower. 16—Tobacco Plant. 17—Flower. 18—Fruit.

1—Blossom. 2—Fruit. 3—Fruit; shell split. 4—Seed. 5—Olive Fruit. 6—Blossom. 7—Fruit; cut lengthwise. 8—Seed. 9—Blossom. 10—Blossom; cut lengthwise. 11—Fruit. 12—Branch of Blossoms. 13—Blossom of Female Tree. 14—Fruit. 15—Fruit; cut in half. 16—Branch of Oil Palm Fruit. 17—Branch of Male Flowers. 18—Single Fruit. 19—Single Male Flower. 20—Single Female Flower.

Cold Harbor, a village in Virginia, nine miles northeast of Richmond, where a bloody battle was fought, June 3, 1864, between the Federal army under Grant and the Confederate army under Lee. Lee held a strong position, having his entire line covered with earthworks. In the early morning the Federal line advanced in a grand assault on the Confederate works. They were obliged to pass over a naked plain covered by the Confederate guns. Bravely and swiftly they advanced, only, however, to be swept down by the enemy's fire. In less than an hour after the first volley was fired 6,000 Union soldiers lay on the ground dead or wounded, and the assault failed. The attack was not renewed, and at night Lee, in turn, assaulted the Federal lines, but was repulsed.

Cold Storage. Food may be preserved either by some chemical change made in it or by keeping out the bacteria of decomposition or by cold. The first method, which includes smoking and the use of large quantities of sugar, has the disadvantage of making the food less wholesome. The second method depends upon the fact that bacteria are kept out with the air, and requires that the bacteria present in the food or vessel be first destroyed, usually by prolonged boiling. By this method the food loses taste, in most cases. Cold storage depends upon the fact that below a certain temperature the bacteria of decomposition cannot work, though they may continue alive. A mammoth's flesh was preserved in the snows of Siberia for probably 20,000 years or more; and when found the dogs ate the flesh. Cold storage is the best method of preserving food. In 1867 the first refrigerator-car ran from Chicago to New York with a load of beef; it was a success, and enormous quantities of meat are now sent east in this way. The butchers in New York and other cities are able by the same method to keep the meat a long time after receiving it. Meat is now sent across the Atlantic in cold storage, especially to England, thus saving the expense and the risks of sending live animals. For about 25 years mutton has been sent in ever-increasing quantities from New Zealand and Australia to England by cold storage, with excellent results to all concerned. Fruits are now sent in refrigerator-cars from California and the south to all parts of the country. Bananas are thus packed, and the heat regulated on the journey, so that the bananas arrive at their destination at just the required degree of ripeness; for cold prevents ripening as well as decay. The cars are built double, with ice at each end, and a fan turned by the forward motion of the car keeps the air circulating over the ice to the meat and back again. The art of cold storage was neglected until the American people developed it into a great industry and common practice.

Cold Wave. From time to time great masses of air that have been chilled by the cold soil of northern Canada flow southward over the United States. Such cold waves, as they are called by the United States weather-bureau, usually cause a sudden fall in the temperature to the extent of at least 20°. The mass of cold air, being dense, usually lies near to the surface of the ground. It pushes its way beneath the less dense air of the south, which curls and rises away before it. The clouds which mark the advance of a cold wave, and often bring snow, seem to be caused by the cooling of the southern air, so that it can no longer contain so much water-vapor. A cold wave will sometimes reach even Mexico, where it is known as the *Norte*.

Cole, Thomas, an American painter, was born at Bolton-le Moors, England, Feb. 1, 1801. At Steubenville, O., where his father settled after emigrating to America, the sight of a wandering portrait-painter, with his canvas and colors, made him decide to become a painter. He painted portraits in several Ohio cities with no success, after which he set up as a landscape-painter at Philadelphia in 1823. Here he had a hard time, glad even to ornament chairs for a living. But in 1825 he painted several landscapes from sketches he had made in the Catskills, which gave him a name among artists. Prosperity at once followed and never afterward forsook him. Among his finest pictures are *Mt. Ætna*, *View of the White Mountains* and *The Voyage of Life*, the last a series of four pictures representing childhood, youth, manhood and old age. He died at Catskill, N. Y., Feb. 11, 1848.

Coleridge (*kōl'rĭj*), **John Duke, Lord,** son of a nephew of the poet, was born in 1820, and graduated at Oxford. He sat in Parliament from 1865 to 1873, where he was solicitor-general and attorney-general under Gladstone. In 1880 he became lord-chief-justice of England. He died on June 14, 1894.

Coleridge, Samuel Taylor, an English poet, was born at Ottery St. Mary, England, Oct. 21, 1772. At the age of four he had read the *Arabian Nights*. Schooled at Christ's Hospital, where he was poorly fed and badly taught, he afterward became a wide reader, reading Homer for the mere fun of it; and here he had as a school-comrade Charles Lamb. Here he planted the seeds of his after ill-health by bathing in the river with his clothes on, and then joining in a game or reading without changing his garments. Entering Cambridge, he was known as a great talker, a gift in which he excelled throughout life. Careless and extravagant, he was so exercised over his money troubles, that he fled and enlisted

in a dragoon-regiment under a false name. Later he was discovered by his friends and sent to Oxford, where he met Southey. In 1795 he lectured and even preached in the Unitarian chapels around Bristol, and founded a short-lived journal. Coleridge and Wordsworth early became fast friends, spending much time together. Their talks on poetry led to their jointly bringing out the *Lyrical Ballads* (1798), containing Coleridge's *Ancient Mariner*, and the little book marked a new departure in poetry. A year later appeared his translation of *Wallenstein*, one of his best bits of work. During these years, troubled with rheumatism and neuralgia, he began to use opium, and the habit grew and enslaved him. It ruined his health, was fatal to his imagination, and weakened his will. Very sad is his lament over his own decay in his beautiful ode on *Dejection*. He had before contributed to the London journals, and now began to issue a weekly paper, *The Friend*, which, however, lived but a few months. As a poet and philosopher Coleridge ranks high; while as a critic he is unsurpassed. Besides his poems, his finest works are, perhaps, *Biographia Literaria* and *Aids to Reflection*. He wrote but little poetry, but that little deserves to be printed on purple vellum and bound in covers of gold. He died at London, July 23, 1834.

Colfax (*kōl'făks*), **Schuyler,** a vice-president of the United States, was born at New York, March 23, 1823. Removing to Indiana, he published a newspaper at South Bend, which he made the foremost Whig journal in the district. Chosen a representative to Congress by the newly-formed Republican party, in 1854, he remained a member until 1869 and was three times speaker. He was elected vice-president on the ticket with Grant in 1868. He died on Jan. 13, 1885.

Coligni, Gaspard de (*deh ko-lēn'yē*), a French general, was born Feb. 16, 1517. A soldier at 22, he fought bravely in the wars against Spain, and was made general of infantry by Henry II. In 1552 he was made admiral of France, though he never commanded on the sea. In 1557 he stubbornly held St. Quentin, with a handful of men, for 11 days against the Spanish army, and, though all hope of defending the town was gone, he refused to surrender and was captured, fighting desperately at the head of a few soldiers. This defense saved France from being overrun by the Spaniards. Imprisonment followed, during which he became a Huguenot. As able a statesman as he was a soldier, he succeeded in outwitting the Guises and securing for the Huguenots freedom of worship. The bad faith of the queen-mother, Catherine dei Medici, brought about the second Huguenot war, in which Coligni was chief commander of the forces of Henry of Navarre, afterward Henry IV. When peace was concluded, Catherine took advantage of the marriage of Navarre with the sister of Charles IX, the king, to order the massacre of St. Bartholomew (1572). Its chief victim was Coligni, who was murdered in his bed, at Paris and his body thrown into the street. Personally, Coligni was one of the noblest Frenchmen of the 16th century and had a profound love for his country.

Colleges, American. The course of study in our American colleges has been constantly enlarging and widening. The knowledge required for entering has also risen greatly, so that now colleges proper—as distinguished from the many high-schools and academies calling themselves colleges—furnish young men with an education fully equal to that of the undergraduate departments of English and German universities. The high conditions of admission are shown by the fact that 15 per cent. of the candidates for the freshman class at Harvard fail to pass the entrance examinations, while ten per cent. fail each year at Yale. Besides the regular course, almost all colleges offer the student, especially in the last two years of the course, elective studies, which, if he prefers, he can exchange for studies in the regular course. Training in writing and public speaking is also carried on, either under the direction of the faculty or in the exercises and debates of the literary societies and in the editing of college papers. Elective studies as a system were not introduced into Harvard till the accession of President Eliot (1869). They have since been widely adopted in other colleges. Practically all colleges grant aid to ambitious students of limited means, while teaching and tutoring or "coaching" often pay the whole of a student's expenses. Harvard bears the name of a Congregational clergyman. Princeton was founded to train up able ministers. And in fact, all the early colleges were founded for a like purpose. Many western colleges were also started as home-missionary schools. One feature of college life is its student-societies, open—most of them literary—and secret. The latter are often known as fraternities, with chapters in many colleges.

Athletics receive their full share of attention. Each college, usually each class, has its baseball-nine, football-eleven and boat-crew. Series of games are played with other colleges each year. The annual football game between Yale and Princeton, as also the annual game between Yale and Harvard, draws thousands of spectators, as does also the spring regatta between the Harvard and Yale crews, which is rowed on the Thames, at New London, Conn. Field-days, in which prizes are given to the winners in running, jumping, vaulting and other matches, are held in most colleges. Over half the colleges of the country have gymnasiums.

Colleges for Women. The first institution in the world founded for the avowed purpose, among others, of extending the benefits of college education to women was Oberlin. Twenty years later, Horace Mann, the great educational reformer, founded Antioch College and in his inaugural address as its president took a strong position in favor of what is now known as co-education. At the present time fully nine-tenths of all colleges are co-educational. Another type of higher educational institution is that in which a college exclusively for women is affiliated with a college exclusively for men. Of these, Girton College in England, affiliated with Cambridge University, was the pioneer. In this country we have Radcliffe affiliated with Harvard and Barnard affiliated with Columbia, and a few others. The first college exclusively for women was founded by Matthew Vassar and opened to students in 1865. The purpose of institutions of this character, as expressed by Mr. Vassar, was to inaugurate a new era in the history and life of woman.

"I wish," he said in his address to the trustees, "to give one sex all the advantages too long monopolized by the other. Ours is, and is to be, an institution for women—not men. In all its labors, positions, rewards and hopes, the idea is the development and exposition, and the marshalling to the front and the preferment of women—of their powers on every side, demonstrative of their equality with men—demonstrative, indeed, of such capacities as in certain fixed directions surpass those of men. This, I conceive may be fully accomplished within the rational limits of true womanliness, and without the slightest hazard to the attractiveness of her character. We are defeated if we start upon the assumption that she has no powers save those she may derive, or imitate, from the other sex. We are defeated if we recognize the idea that she may not with every propriety, contribute to the world the benefits of the matured faculties which education evokes. We are especially defeated if we fail to express, by our acts, our practical belief in her pre-eminent powers as an instructor of her own sex."

In the development of opportunities for higher education the work of the women themselves has been very important. Mrs. Emma Willard established a school for young women at Middlebury, Vt., and in 1829, founded the famous Female Seminary at Troy. The joint efforts of Mary Lyon and Zilpah P. Grant led to the establishment in 1837 of Mount Holyoke College at South Hadley, Mass. Another name which occupies a prominent place in the history of higher education for women, both in the eastern and western states, is that of Catherine E. Beecher.

College Entrance-Examination Board, of the middle states and Maryland, was established in 1899 at the instigation of Nicholas Murray Butler to obviate the difficulties arising from the diversity of standards of admission required by the various colleges and universities throughout the country. It is composed of representatives of colleges and secondary schools in the Middle States and Maryland whose duties are to hold yearly a series of college entrance-examinations with uniform tests in the various subjects and to issue certificates based upon the results of these examinations. The examination-papers for each subject are made out by a committee of three (two college professors and one high-school instructor), and then revised by a committee made up of the original three members, together with five additional high-school teachers. The papers are then sent to the places where examinations are held, which now include nearly all the larger cities in the United States, and some cities in foreign countries. No candidate fails, unless judged unfit to pass by at least two examiners. The certificates issued by the board are now accepted by nearly all colleges of the United States. Pupils who fail may have their examination papers sent to the college which they wish to enter, and, if their standing is satisfactory to that institution, they may be admitted.

College, Going to. To raise the question whether or not one should go to college is much like questioning the advisability of one's doing much reading and thinking. There are, for various reasons, many persons from whom only a minimum amount of mental activity can be expected, and a meagre education must suffice for them. But, ordinarily, any one who finds it possible to go to college, or who has energy enough to make it possible, can profit greatly by going.

It is true that occasionally a successful, or even a college-bred, man opposes a college-course for his son, on the ground that such a course unfits one for business instead of helping him in it.

But, in general, one vital condition of success in life is a knowledge of what people have thought and done in the past: a knowledge of the principal problems that have confronted them and the ways in which they have been solved. This is one of the things that a good college-course attempts to give, and does give. It gives it in the study of literature, history, natural science, art and other subjects, the various studies representing nothing more than the main lines of human endeavor.

The college-course accomplishes this object much better now than it did 25 years ago. At that time nearly all students were expected to take much the same course, consisting of Latin, Greek and mathematics, no one of which subjects dealt extensively with the actual problems of life. But since that time many subjects have been introduced, such as sociology, domestic science, domestic art, manual training and educational psychology, be-

cause they deal with real issues; and most of the old lines of study have been so modified in content and method that they function much more than formerly. Therefore, as a result of a good college-course, to-day, one becomes reasonably well-informed in regard to modern problems, and he has such an interest in them that his mind is likely to be alert and active in regard to these and other problems in the future. He is then well-prepared to be identified with the workers of the world.

All this applies as well to college-education for young women as for young men. It is true that it used to be a question whether the ordinary college-course for young women, while it possessed many merits, did not to a considerable extent inculcate a distaste for home-keeping—a sad result, indeed. It tended to do this through neglect of the problems of the home, if in no more positive way. But that evil is now being rapidly remedied, just as are the somewhat similar but lesser evils in the men's colleges.

But knowledge of and interest in human problems are only some of the benefits of a college course. Any one who spends three or four years at college forms there many of his main friendships for life. It is an especially cultured, ambitious and able class of persons that one meets in college; and to cement enduring friendships there that one will often enjoy later is one of the chief objects of going to college. Many an adult suffers from lack of numerous well-educated and close friends. The suggestion follows from this fact that study should not be taken so seriously as to exclude social life at college.

The college-graduate, to be sure, is likely to feel his lack of preparation for most lines of work, the moment he leaves college and sets out to earn a living. He must often at first take a position much inferior to those occupied by other persons possessing little education. But his superior knowledge, training and associations give him innumerable advantages over such persons in the race for advancement, and usually, before many years are passed, he passes beyond them. He not only occupies a higher position in his chosen work, too, but he takes higher rank as a factor for progress in community life.

The selection of a good college is not an easy matter. A college that is very good for one person may not be desirable for another. Large colleges or universities possess the advantage over small ones of having more valuable equipments and of paying larger salaries to head-professors. But the difficulty with the large college is that the average student who attends it becomes lost in the mass. The lecture-plan is largely followed, and the classes are large, so that few responsibilities besides getting his lessons fall upon the ordinary student, and he has little or no personal contact with his instructors. Many of these, also, are poorly paid underlings, the head-professors, worth large salaries, working mainly with advanced students.

The small college, on the other hand, is very likely to secure a close contact between teacher and student, and each student is likely to feel more social responsibility. The difference is much the same as that between life in a great city and that in a small town. Any person having any vigor is likely to count for something in a small community; while only the born leaders are called forth in great cities. Many enlightened persons to-day are inclined to favor the small, reasonably well-equipped college to the very large one for the ordinary student.

But the college that one chooses should depend very much upon its strength in the line of study that one expects mainly to pursue. Moreover, whatever college one attends, the courses that he selects after he arrives there should not be determined solely by their titles. In fact, one should not choose a college chiefly either because it is small or large, but because there are certain persons of power there whom he wants and can have as his own instructors. The average instruction in any school or college is not very good, and frequently it is very poor. This is not due to any carelessness on the part of any class; it is true because good teaching is so difficult an art that it is not common. Not infrequently professors with national reputations are miserable instructors. They can attract students, but cannot hold them. In choosing a college, therefore, one should make sure, by correspondence with friends and in other ways, that his prospective teachers will be a source of inspiration. It makes little difference how learned the faculty as a whole is, or how many members it may contain; the very few men who will instruct a given student are practically the institution for that particular student.

The principal of the high-school nearest to you can probably be relied upon to give good advice about particulars in regard to going to college. By writing to the secretary of any college one can obtain desired information, including the catalogue of the institution. See, also, COLLEGES, AMERICAN. F. M. MCMURRY.

College of the City of New York. In 1847–8 the city board of education established an institution for higher education which was at first known as the New York Free Academy. In 1866 it became a college, but it had no separate board of trustees until 1900, when the members of the board of education were replaced by the president of that board, acting with the president of the college and nine members

chosen by the mayor. The college is now housed in splendid four-million-dollar buildings. A notable feature of its recent development has been its co-operation with the city. For example, the Department of Chemistry works with the municipal testing laboratories in the analysis of products purchased, with the Health Department in food analysis and sanitary inspection; the Department of Psychology acts with the Board of Education in the treatment of defective children.

Collenchyma (*kŏl-lĕn'kĭ-mȧ*) (in plants), a peculiar kind of tissue in many plants which serves as an elastic mechanical support and is developed immediately beneath the epidermis. It may be recognized in cross-sections by the fact that its cell-walls are thickened at the angles and have a characteristic pearly white luster.

Col'lingwood, a town of 7,291, one of the principal seaports on Georgian Bay (Ontario), beautifully located at the foot of the Blue Mountains. Enjoys a large grain trade with Chicago. A lumber center for all the ports on the north shore of Georgian Bay. It is on the Grand Trunk Railway, and the home port of the Northern Navigation Co., the steamers of which ply thence to the numerous lake-ports.

Col'lins, William, an English poet, was born at Chichester, Eng., Dec. 25, 1721. While a schoolboy he wrote his *Oriental Eclogues*, the most popular of his poems during his lifetime. After leaving Oxford he sought to make a living as an author in London, but his health and irregular ways of working unfitted him for success in such a life. His place among British poets is due to his *Odes*, which did not meet with the praise they deserved, when they first appeared, and were little valued even by such critics as Dr. Johnson and the poet Gray. In 1753 Collins' reason gave way, and he died on June 12, 1759, utterly unnoticed by a single newspaper of his time His finest odes are, perhaps, *To Evening* and *The Passions*, though his most popular poems are that on the *Death of the Poet Thomson* and that beginning with "How sleep the brave."

Col'lins, William Wilkie, an English novelist, was born in London, Jan. 8, 1824. He had a good schooling, spent four years in business, and studied law. However, he turned to writing, first bringing out a life of his father, who was an eminent painter. His novels took high rank, and he became famous for devising deep and tangled plots for his stories. Hence he was called the Weird Concocter. His best novels are *The Woman in White*, *The New Magdalen*, *No Name*, *Poor Miss Finch*, *Armadale* and *The Moonstone*. He died in London, Sept. 23, 1889.

Collodion, a clear, colorless, gummy and highly inflammable liquid prepared by dissolving gun-cotton or pyroxylin in an equal-parts mixture of alcohol and ether. The gun-cotton is prepared from common cotton-wool by first boiling it in a solution of sodium carbonate, washing and drying it and, second, by placing tufts of it for eight or ten minutes in a mixture of nitric acid, water and sulphuric acid, and again washing and drying. Collodion was once extensively used in photography, and for some lines of that art is still used. It is very commonly used in surgery and chiropody, being especially valuable for scratches, chafings and minor cuts, as it keeps out poisonous substances and is not soluble in water. In one of its common commercial forms it is known as New Skin.

Coll'yer, Robert, was born at Keighley, England, Dec. 8, 1823. When a boy, he worked in a factory and afterward became a blacksmith. All his spare time was spent in educating himself. In 1850 he emigrated to America, settling in Shoemakertown, Pa., as a blacksmith and Methodist preacher. He afterward became pastor of a Unitarian church in Chicago, and later on of the Church of the Messiah in New York city. His sermons and books, especially his *Lectures to Young Men and Women*, have made him widely known, and the story of the rise of the blacksmith-preacher to a commanding position is familiar to all Americans. A literary society of Cornell University asked Mr. Collyer as a great favor to make them a horseshoe to hang in their hall, saying that Cornell boys could have no better stimulus than a piece of his handiwork always in sight. The preacher complied, and, asking a blacksmith to allow him to use his hammer, soon proved that he had not lost his skill. A picture of the scene has been painted, showing the white-haired old man with a blacksmith's apron tied over his clerical garb, fashioning a horseshoe on the anvil. He died Nov. 30, 1912.

Cologne (*kō-lōn'*), the capital of Rhenish Prussia, lies on the left bank of the Rhine. It is built in a half-circle, surrounded by the *Ringstrasse*, a 60-foot-wide boulevard. Its old churches and buildings of the 11th, 12th and 13th centuries, of Gothic, Romanesque and Transition styles of architecture, are of great interest. But its most famous building is the cathedral, one of the finest specimens of Gothic architecture in Europe. Said to date back to the reign of Charlemagne, it was burned in 1248; its rebuilding was begun in about 1270, and was carried on interruptedly till 1509. It was not until 1823 that work on it was recommenced, and the spires were not finished until 1880. Its entire cost was about $10,000,000 Cologne is a fortress of the first rank, detached forts encircling the city at a radius of four miles from the cathedral. It is well-placed for commerce, and many manufactures are carried on, among them the

famous *eau-de-cologne*. The town was founded by the Ubii about 30 B. C. It became a part of the German empire in 870, was a member of the league of the Hansa towns in 1201, and, losing its independence, came under the sway of Prussia in 1801. Population of Cologne (Köln), 516,167.

Colombia (*kô-lôm'bê-ä*), a South American republic, in the northwest corner of the continent, formerly including the Isthmus of Panama. It is washed by two oceans, and has 3,000 miles of coast and an area estimated at 500,000 square miles.

Surface. In the east are low, wide plains, and in the west three great ranges of the Andes spreading out like the ribs of a fan. The deep gorge through which the Patia River forces its way to the Pacific between steep walls from 10,000 to 12,000 feet in height forms the only break in the western range of the Andes from Darien to Patagonia.

Drainage. The rivers chiefly belong to the Atlantic system. The Ica, a feeder of the Amazon, provides quick and easy communication with Brazil. The Meta, an affluent of the Orinoco, affords navigation from near Bogotá to the Atlantic. The Magdalena-Cauca and the Atrato are more important, flowing nearly the length of the land, emptying into the Carribbean, and offering feasible communication to the tablelands.

Climate and Rainfall. In a day's journey one may encounter all the climates of the world, from the valleys choked with the rich growth of the tropics to the never-melting snows of the peaks. On the lowlands there are a dry and a rainy season, on the tablelands *two* of each. The rainfall is enormous, short rivers carrying almost continental volumes of water.

Natural Resources. Colombia distinctively is a mineral land. It abounds in alum, amber, amethysts, antimony, asphalt, coal, copper, emeralds, gold, iron, lead, limestone, magnesium, mercury, platinum, potash, salt, silver, soda. Spain in three centuries mined $300,000,000 of precious metals. The forests contain the aloe, brazilwood, cinchona, fustic, indigo, logwood, sarsaparilla, tolu balsam. The flora ranges from tropical varieties to alpine or arctic types.

Agriculture. On the loftier levels the crops of the temperate zone are cultivated; on the coast the banana, chocolate, cocoa, coffee, cotton, pepper, plantains, rice, sugar, tobacco and yams. On the plains cattle and horses are largely bred.

Manufactures and Commerce. Beyond basketmaking, dying, tanning and weaving, there are almost *no* manufactures, though distilleries, glassworks, cigar-factories and sulphuric-acid factories have been founded. Other manufactures include candles, iron, "panamas," shoes and soap. Excellent harbors on both coasts create a favorable situation for commerce, but the absence of good roads and railways hampers trade. Honda, the head of steam-navigation on the Magdalena, is connected by rail with Bogotá, and there are other short railroads, but they serve only the most limited areas. The principal exports are cinchona, coffee, cotton, hides, indigo; the minor items balsam, ipecac, ivory-nuts.

Education. Public instruction was in 1870 entrusted to the state, the schools reformed, teachers brought from Europe, and, anticipating the rest of South America, primary education made free. Higher education is provided by normal schools, state colleges, technical schools and a national university.

Races. The most densely populated part of the country is the high and healthy tableland of the eastern Cordilleras, where stands the capital, Bogotá (population 150,300), 8,694 feet above the sea. Of the natives, the Chibchas were the chief, being in civilization almost equal to the Peruvians. Many other tribes lived among the mountains, and about 200,000 survive. The population is made up of whites, Indian half-breeds, mulattoes and Zamboes (half negro and half Indian).

History. Amerigo Vespucci visited the northern coasts in 1499; three years later Columbus tried to found a Spanish colony in Panama; Balboa discovered the Pacific in 1513; and the native empire was overcome by Jimenez de Quesada in 1536. The Spaniards ruled badly, and reduced the Indians to serfdom. In 1819 was formed the Republic of Colombia, including what are now Colombia, Venezuela and Ecuador. The character of the people and the lack of close communication between districts far apart made the state unwieldly, and in 1831 the confederation fell to pieces. What now is Colombia was first called the Republic of New Granada, but took its present name in 1861. Its constitution is modeled after that of the United States. Besides Bogotá, the capital, the other chief towns are Cartagena (population 27,000) and Medellin (60,000). Panama was formerly a part of Colombia, but seceded in Nov., 1903. The secession was caused by the action of Colombia in refusing to ratify a treaty which had been negotiated with the United States for the construction of the Panama Canal, and the refusal was held to be directly opposed to the interests of Panama.

Colombo (*ko-lom'bo*), capital of Ceylon, named by the Portuguese after Columbus. It has a fine harbor, and within the town are two mission-colleges. Colombo was captured by the British in 1796. It has railway connection with Kandy, 60 miles to the northeast. Population, 158,228.

Colon (*ko-lon*) (formerly Aspinwall), a seaport at the Atlantic extremity of the Panama Canal. During the gold-rush to California in 1849 the necessity for a short route between the two oceans finally resulted in railroad connection between Colón and Panama. Colón is the terminus of the Kingston cable. The canal-authorities have laid out regular streets, built a good hospital and in various ways improved the town, which has a population of about 20,000.

It is situated on an island on either side of which are the ports of Manzanillo and Limon Bay.

Colonna, Vittoria, the best-known poetess of Italy, was born in 1490, daughter of the constable (a high officer on the European continent in the middle ages) of Naples, and of a famous Roman family. She was married at 17, having been betrothed when only four years old. She was a close friend of Michael Angelo, and admired by the poet Ariosto. Her poems appeared in 1538. She died at Rome in February, 1547.

Col'ony, a name applied to the foreign dependencies of a state. Roman colonies were military settlements, usually towns planted to overawe a conquered country. The Greek colony consisted of a band of emigrants, who, as a rule, because of political troubles sought a new home beyond the seas. According to the story of the Æneid, Rome itself was a colony, in the Greek sense, of Troy. Greek colonists did not go far inland, but fringed the shores of Asia Minor, Sicily, southern Italy and even the Crimea with trade-settlements, many of which, in wealth, were in advance of the cities of Greece proper. Modern colonies began a little before the discovery of the New World in the 15th century. Love of adventure, thirst for gold and the desire to spread religion sent Europeans to the far west and east. A long and bitter struggle between the different states for this new land left some of them, at the end of the 19th century, much shorn of their possessions. Spain lost South and Central America, with Cuba and Porto Rico in the West Indies and the Philippine, Mariana and Caroline groups of islands in the east, though she still has possessions in Africa, with an area of 80,580 square miles and a colonial population close upon 300,000. Portugal has lost Brazil, but has long strips on both coasts of Africa and a few small settlements in India, together with the Madeira, Cape Verd and Azores Islands. Holland has lost Ceylon and the Cape of Good Hope to England, but is still enriched by Java and the Spice Islands, Sumatra, the Celebes, the Moluccas, New Guinea (in part) and Curaçao. The French have fared badly. India and half of North America would, perhaps, be French to-day but for two Englishmen, Clive and Wolfe. Algeria and Cochin-China have been acquired later, as also Tunis, Tonquin and Madagascar. The colonies and dependencies in Asia, Africa, America and Oceania extend to 4,227,826 square miles, with a total population exceeding 56 millions. Italy has the port of Massowah, on the African shore of the Red Sea, together with Italian Somaliland and other African dependencies. Germany has only lately reached out for colonies, but has gained valuable possessions on the east and west coasts of Africa, in China and in New Guinea. The area of Germany's colonies exceeds one million square miles, with a population of 12,686,000.

The most important colonies ever founded were the 13 colonies of England which now are the United States. Though England lost half of the North American continent, her colonies dot the globe; cover much more land than those of all other countries taken together; and through them she rules over an area of 11,400,000 square miles (including the United Kingdom) with a total population of about 410,000,000.

Counting the United States as a British colony, the history of modern colonies is the story of the spread of the Anglo-Saxon race. In North America, Australasia and South Africa this race already is in possession of the only large tracts of uninhabited land where white men can work and thrive. The main British possessions are, in Europe, Gibraltar, Malta, Cyprus; in North America, Canada, Newfoundland, the Bermudas, with various West India islands, Honduras; in South America, Guiana and the Falkland Islands; in Africa, Cape Colony, the Transvaal, the Orange River Colony, Natal, Mauritius, Ascension, St. Helena; in Asia, India, Ceylon, Straits Settlements, North Borneo, Hong-Kong; in Australia and Oceania, Australia, Tasmania, New Zealand, New Guinea (in part) and Fiji.

Color, a sensation of the eye produced by light-waves. When a beam of white light is passed through a prism of glass, it is stretched out into a band of light called the prismatic spectrum. One part produces the sensation of red; another part, the sensation of green; another, of blue; and so on These different sensations are called colors. As was proved by Newton, Young and others, each of these different colors is produced by light of a different wave-length, and white light consists merely of light in which all these colors are combined in the proper proportion. Newton showed that colored light may be produced from white light in one of three ways: (1) By refraction in a prism or lens, as seen in the rainbow. (2) By diffraction, as, for instance, in the colors seen in mother-of-pearl and in the blue color of the sky. (3) By absorption, as, for instance, the red color of a brick-house or the green color of grass.

where all the white light which falls upon the house is absorbed except the red, and all which falls upon the grass is absorbed except the green.

The mixture of colors is a very complicated subject, but the student will find it very lucidly treated in Captain Abney's little book: *Color Mixture and Measurement* in the Romance of Science Series; as also in Shelford Bidwell's *Curiosities of Light and Sight.*

Colorado is located in the center of that portion of the United States west of the Mississippi River. The state is quadrilateral in shape; and is bounded by Wyoming and Nebraska on the north, Nebraska and Kansas on the east, Oklahoma and New Nexico on the south and Utah on the west.

Area. The state is about 370 miles long and 280 miles wide, while the gross area of the state is 103,948 square miles. Deducting a few small lakes and other bodies of water leaves 103,658 square miles of land area. Colorado is larger than Great Britain, half as large as France, and nearly equal in area to New York, Pennsylvania, New Jersey and Delaware combined.

Mountains. The continental range of the Rocky Mountains extends across the state from north to south near its center. Pike's Peak, west of Colorado Springs, is the most famous peak in the state, but not the highest, it being one of many that have an elevation of 14,000 feet to 14,500 feet.

The surface of Colorado has two natural divisions,—mountains and plain. The mountain-division has an altitude from 5,000 feet to 14,000 feet. The plain-division is from 4,000 feet to 5,000 feet high.

Rivers. The principal rivers of the eastern slope are the South Platte and the Arkansas. The Rio Grande drains the San Luis valley. The Grand flows toward the southwest. The Yampa and White are tributaries of the Green, which unites with the Grand in eastern Utah and forms the Colorado River. None of these rivers is navigable. These rivers with their numerous branches furnish a supply of water for irrigation purposes.

Climate. The climate is delightful; the air is dry, the sunshine abundant. There are rains throughout the warm parts of the year and snows in winter, but both are moderate in quantity. The altitude and dryness minimize the heat in summer and the cold in winter. The perpetual-snow line varies between 13,000 and 14,000 feet, except on the side of the mountains sloping to the north and in deep canyons where it is lower.

Mineral Springs. There are more than seventy-five groups of mineral spings having medicinal properties. The most noted ones are located at Manitou, Canon City, Idaho Springs, Glenwood Springs, Hot Sulphur Springs, Steamboat Springs, Pagosa Springs, etc.

Land. The report of 1911 of the Commissioner of the United States General Land-Office, Washington, D. C., shows that 20,599,100 acres of government land were unappropriated and unreserved, of which 19,069,624 acres had been surveyed and 1,529,476 acres had not been surveyed. Since the date of that report there have been many entries by settlers on such lands. When Colorado was admitted to the Union, Congress granted to the state two sections of land in every township for the support of the public schools.

The soil on the uplands is a rich, sandy loam, varied in some localities by clay or adobe. Along the river-bottoms it is largely alluvial; in some places siliceous and micaceous.

Agriculture. The recent development of agriculture through irrigation has been the wonder of western civilization. In 1910 there were 46,170 farms, average value $10,645. The average number of acres per farm was 293, which was more than twice the size of the average farm in the United States. This is due to the number of stock-grazing-farms. Farm-products are cereals, roots, vegetables, fruit, hay-fodder, live stock, wool, dairying, poultry, honey, etc.

Colorado excels other states in the average value per acre of farm-crops. Owing to the superior quality of Colorado fruit, it is very extensively shipped to other states.

Mining. Colorado leads in the production of the precious and allied metals, producing twice as much gold and silver as any other state and more than one third of the total output of the United States. Colorado possesses inexhaustible coal-deposits, and in 1906 was seventh among the coal-producing states, surpassed by Pennsylvania, Illinois, West Virginia, Ohio, Alabama and Indiana in the order named. It ranked second among the states as a producer of anthracite, being surpassed by Pennsylvania. The Colorado coal-fields are found on both sides of the Rocky Mountains, those on the western slope being the largest and most important in quantity and quality. In one year the state produces 12,000,000 tons, which are valued at over $17,000,000, and employs 15,864 men in and about the mines. Coke is manufactured extensively, and the state has abundant deposits of iron ores.

Manufacturing. The great variety of raw materials gives Colorado advantages as a manufacturing state. The leading manufacturing industries are the iron and steel plant at Pueblo, foundries and machine-shops at Denver, smelting of gold, silver, copper, lead and other ores, canning-factories, creameries and cheese-factories, flouring and grist-mills, printing and publishing plants, saw-mills, beet-sugar factories, etc.

Population. Colorado's total population in 1900 was 539,700. It is now placed by the latest federal estimate at 975,190. Eighty-three per cent. are American born and 17 per cent. foreign born. Colorado has only 1.6 per cent. negroes, a less percentage than other states, and a less percentage of Orientals than any of the Pacific states. As to Indians, Colorado has fewer than either New York or Pennsylvania.

Railroads. Colorado has better railroad accommodations than any other Rocky Mountain state, only one county, Baca, being without railroad communication. There already are over 5,000 miles of railroad within its boundaries, and more are being constructed. The principal railroads are the Denver and Rio Grande, Colorado and Southern, Union Pacific, Burlington, Atchison, Topeka and Santa Fe, Colorado Midland, the Denver, Northwestern and Pacific and the Missouri Pacific roads.

Education. Colorado ranks among the foremost in education. There are more than 2,000 school-buildings, with 5,000 teachers and an attendance of 168,000 pupils. The annual expenditure for school purposes is five and one-half million dollars. The state institutions of higher education are the State University at Boulder, State School of Mines at Golden, State Agricultural College at Fort Collins and the State Normal School at Greeley.

History. Colorado was acquired in three tracts: a portion of the north and east by the Louisiana-purchase of 1803; a portion of the west and north by the Mexican cession of 1848; the remainder by a purchase from Texas in 1850. Coronado, in 1541, is supposed to have been the first white man to set foot within the present limits of Colorado. In 1776 Escalante traversed the western and southern portions. The first organized American exploration was made under government authority in 1806 by Lieutenant Zebulon N. Pike. The next expedition was undertaken in 1819 by Major Stephen S. Long. In 1842 John C. Fremont began a series of five explorations in search of practicable rail-routes.

The first important discovery of gold was made in 1858. At this time trappers and scouts were about the only white inhabitants of Colorado, and there were only a few forts, stockade and trading-posts; such a trading-post was established in 1840 on the present site of Pueblo. When the first gold-hunters came to Colorado the parks were inhabited by the Ute Indians; the plains by the Cheyennes, Arapahoes, Kiowas and Comanches. The Indians have since been placed upon reservations.

In 1876 Colorado was admitted into the Union as the Centennial State. The prehistoric remains, consisting of numerous cave-dwellings and ruins found in southern Colorado, have been set apart as a governmental reservation.

Colorado (*kŏl'ō-rä'dō*) (meaning red), a river 900 miles long and navigable for 600 miles. It is formed by the junction of the Grand and Green Rivers. Its main branches are the San Juan, Flax, Bill Williams and Rio Gila. It flows southwest through southern Utah and northwestern Arizona; next separates Arizona from Nevada and California; then enters Mexico and empties into the northern end of the Gulf of California. The Colorado itself and most of its branches flow at the bottom of deep cañons, slowly cut out by water during the lapse of eons. Below the mouth of the Flax, for nearly 400 miles, the cañon walls rise from 4,000 to 7,000 feet, forming the Grand Cañon of the Colorado, one of the great wonders of the world. In 1906 the river created Salton Sea in southern California.

Colorado River of Texas is over 900 miles long, and averages 250 feet in width. In winter steamboats go up the river as far as Austin. Throughout most of its length it flows through a region of rich soil, and is a beautiful, clear stream. It empties into the Gulf of Mexico, at Matagorda Bay.

Colorado Springs, county seat of El Paso County, is an attractive city, 75 miles south of Denver. Its altitude is 6,000 feet, and it is situated on a plain near Pike's Peak, and is known the world over as a health and pleasure resort. The city possesses a handsome opera-house, five clubs, several fine school-buildings, the State Blind and Mute School, sanitariums, hospitals and fine churches. It was settled in 1870: but the Cripple Creek gold discovery in 1891 nearly doubled its population. Colorado Springs is served by six railroads, and has all the adjuncts of a modern city. Population, 31,717.

Colosseum (*kŏl'ŏs-sē'ŭm*), the largest of the Roman amphitheatres. Amphitheatres were oval-shaped buildings, used by the Romans for combats of gladiators and for wild beast fights. In the theatre, where plays were performed, the seats faced the stage in a half-circle; in the amphitheatre the seats entirely surrounded the place of performance; hence the name, from *amphi*, meaning all around. The Colosseum, besides being the largest of these buildings, is the best preserved, and is one of the most interesting ruins in the world. It was begun by Vespasian, and finished by Titus in 80 A. D. It covers about five acres of ground, and was able to seat 87,000 persons. It is 612 feet in length, and 515 feet wide. When Titus dedicated it, 5,000 wild beasts were slain and the games lasted for a hundred days. On the outside it is 160 feet high, built in three rows of columns and surrounded by a row of pilasters. Between the columns are arches, forming open

galleries running throughout the entire building. On the inside the open space in the center was covered with sand or sawdust, while the games were going on, and so was called the *arena*, from the Latin word for sand. Around the arena was a gallery where sat the emperor, senators and vestal virgins. Above were three other tiers of seats, corresponding with the three rows of columns on the outside. The Colosseum in the middle ages gave rise to the saying: "While stands the Colosseum Rome shall stand; while Rome shall stand, the world."

Colossus (*kō-lŏs'sŭs*) **of Rhodes,** a huge statue of Helios (the sun), the chief god of the Rhodians. It is said to have been the work of Chares of Lindus, who spent 12 years on it, finishing it in 280 B. C. It was called one of the seven wonders of the world, though not a masterpiece of sculpture. Its height was from 90 to 120 feet. It stood near the harbor; but the story that it was placed astride the entrance is erroneous. In 224 B. C. it was overthrown by an earthquake, and lay an object of wonder until 653, when it was sold to a Jew for old metal.

Colt, Samuel. See REVOLVER.

Columbia. See DISTRICT OF COLUMBIA.

Colum'bia or **Oregon River** is 1,400 miles long. Next to the Yukon, it is the largest river on the American Pacific coast. It rises in the Rockies of British Columbia, flows through Washington, separates that state from Oregon, and empties into the Pacific. Its mouth forms an inlet from three to seven miles wide and 35 miles in length. Its main branches are Snake River and Clarke's Fork. There are many falls and rapids, so that, though it is navigable for some 660 miles, freight has to be carried by railroads past the various breaks of the river. The salmon-fisheries are noted.

Columbia, Pa., a borough in Lancaster County, on the left bank of the Susquehanna River, 80 miles by rail west of Philadelphia. A railroad-bridge across the river connects the town with Wrightsville. The town was founded in 1726 by English Quakers. Its factories include rolling-mills, flouring-mills, foundries, tanneries, silk, lace and pipe mills, wagon, brush, stove, novelty, embroidery and shirt-works. It also has manufactories of railroad-iron. It has an active civic life, good schools and a public library. Population, 11,454.

Columbia, the capital of South Carolina, is situated on the left bank of the Congaree River. The town is beautifully laid out with broad and well-shaded streets, all of which cross at right angles. Having been the capital of the state since 1790, it has many imposing public buildings, including the state-house, penitentiary, hospital for the insane, etc. Several well-known colleges and quite a number of fine cotton-mills are located in the city. When the city was evacuated by the Confederates at the approach of Gen. Sherman in the spring of 1865, large quantities of cotton piled in the streets caught or were set on fire, and all the business section and many private residences were consumed. The population in 1900 was 21,108; to-day it is 33,506.

Columbia University, located in New York city, was chartered in 1754 as King's College. During the Revolutionary War the work of the college was suspended, and the building was used as a hospital. College work was resumed in 1784, and the name of the institution changed to Columbia College. Under this name the college has had a long and prosperous career. The law department was established in 1858; the medical department in 1860; the school of mines in 1863; the school of political science in 1880; the school of philosophy in 1890; and the school of pure science in 1892. Barnard College for women, founded in 1889, became affiliated in 1890. In 1896 the name of the institution was changed to Columbia University. It is now an amply equipped and richly endowed institution. It has a library of 550,000 volumes, 888 officers of instruction and 7,322 students, exclusive of summer-school and extension students.

Columbine (*kŏl'ŭm-bīn*), a well-known and popular wild flower, which is widely diffused, and which has been suggested as the national flower of the United States. The leaflet is three-lobed and the flower, which passes from yellow to red, has five petals with long spurs, giving it a striking resemblance to the liberty-cap.

Columbus, Christopher. In 1470 there arrived on the coast of Portugal, on a plank that was part of the wreckage of a privateer sunk in a sea-fight, an adventurous mariner. Born in Genoa, Italy, perhaps in 1436, perhaps in 1446, he was of the stature and coloring of Norse pirates. His eyes were as pale a blue as sea-ice, his red and white skin was bronzed by 20 years' exposure to wind and sun; his auburn hair, already pointed with silver, shone like a nimbus above a handsome, smooth-shaven, aquiline face. Besides being a skilled navigator, he was a man of learning, temperate habits and speech and as strict piety as if he were of some religious order. These qualities must have recommended him in Lisbon, for the Portuguese were among the most ardent Christians and the most daring voyagers in the world. Grad-

CHRISTOPHER COLUMBUS

ually the facts came out that Columbus, Colombo or Colon (for he used the Latin, Portuguese and Spanish forms of his name indifferently) had learned geography, mathematics and nautical astronomy, and had coasted the Mediterranean and voyaged to the Guinea coast. He had read Marco Polo and Sir John Mandeville, and knew of the strange, disquieting adventures of Portuguese voyagers who had been blown far to the westward. He boldly held the not original opinion that the earth is a sphere.

Although unknown and penniless, this man was so remarkable that within a year he had married the daughter of Palestrello, an ex-governor of the Madeira Islands and a learned geographer. He thus had access to the dead man's maps, charts and calculations that confirmed his opinion that the Indies and the land of Kubla Khan could be reached by sailing westward. He presented a plan for an expedition, first (about 1475) to Genoa, then to John II of Portugal, to Henry VII of England, to two Spanish dukes and finally to Ferdinand and Isabella of Castile.

Twelve years he spent, a beggar at indifferent courts, dismissed as impracticable by the wise, ridiculed by the foolish, betrayed by cupidity, deluded by false promises. His wife died, his property was exhausted, he had been made the buffet of capricious fortune. But he was not dismayed. When learning, pietv, self-control and a single-hearted purpose go hand in hand, they may defy all the fates to baffle them. At 55 [?45?] years of age we find him (1492) leading his motherless son, Diego, through the lovely landscape of Andalusia, begging bread and shelter of the monks of La Rabida, a monastery that overlooks the harbor of Palos. Undiscouraged, he poured the tale of his incredible ambition into the ears of the simple brothers, only to find among them a geographer who could understand his plans and an ex-confessor to Queen Isabella who could recommend him to royalty. On the 3d of August, 1492, the monks of La Rabida bade him Godspeed out of the harbor of Palos, on the most momentous voyage in history.

How perilous that voyage was you must read a long biography to realize. It lasted ten weeks. The crews of 120 men were mostly made up of criminals and vagabonds, who had choice of this dangerous adventure or of imprisonment for their misdeeds—as treacherous a lot of cutthroats as ever commander shipped.

The Island of Guanahani was sighted on the 12th of October, 1492, and the banner of Spain unfurled above the soil of the New World. The details of this and of his three subsequent voyages are given in every school-history. The great discoverer had the misfortune—for Spain—to sail too far south. Had he cleared the Bahamas, he must have reached the Carolina coast and discovered the continent of North America. But he struck the wilderness of islands, large and small, that guard the Gulf and the Caribbean Sea, and thus won tropical America for Spain and Portugal, leaving the more valuable northern continent for England and France to colonize and fight over. He thought the earth-sphere much smaller than it is and Asia much larger, and mistook the archipelago of the West Indies for islands fringing India, China and Japan. So he continued to explore these, seeking always the continent beyond. On his fourth and last voyage he skirted South America, found the Orinoco River, and reached Yucatan. The sweep of the Gulf Stream made him look for a passage westward about where we are digging the Panama Canal to-day. On his first voyage he built a fort on San Domingo, now Haiti, out of the wreckage of the Santa Maria, and planted a colony. Then he returned to Spain with gold, strange plants and animals and six natives for baptism. After his second voyage, in 1493, misfortune, misery and insults marked the remaining ten years of life, lightened by brief periods of wealth, honor and royal favor. In the failure of his colonies too little allowance was made in his own time for the evils of a tropical climate, savage natives and uncultivated land. Too little is made by his biographers of the character of Spanish colonists. The adventurers who went with Columbus were inspired, not by desire for a home in the New World, but by greed for gain and by religious bigotry that had its logical result in exploitation and cruelty. His long absences from Spain gave ambitious and unscrupulous men at court ample time to plot, so that adequate support and authority were withheld from him. From his third voyage (1498) he was sent home (1500) in irons and, as he feared, to disgrace and death. Tardy reparation made and his enemies punished, he had the magnanimity to set out on a fourth voyage in May, 1502, for their majesties of Spain. In May, 1506, he died at Valladolid, Spain, aged 60 or 70. In 1796 his bones were removed from San Domingo to the cathedral at Havana, Cuba. The title Duke of Veragua was conferred on his son Diego, and continues to-day in the descendants of his great-granddaughter.

Columbus' task was to conceive a beneficent idea and to put it to the proof in the most obvious way. For this his knowledge was as complete as possible, his plan definite, his purpose undefiled by self-interest, his resourcefulness and persistence unbounded, his courage sublime. He found a path across the unknown seas, and charted it so others could safely follow. He had

sown the seed, leaving to others the harvest. Even the continent he had discovered was given the name of a later, lesser man. But for that he probably would have cared little. His personal name Christopher, he shrouded in a mystical, pietistic signature which symbolized the fact that he considered himself but a servant of Christ, Mary and Joseph. Above his title which made the descendants of a Genoese woolcomber grandees of Spain, he held his rank of admiral. He was the greatest mariner the world had seen, or was to see, undespairing, undismayed. By his will he directed that the head of his house, in every generation should describe himself as Duke of Veragua, *The Admiral.* The best known and most accessible life of Columbus is probably the one by Washington Irving. It needs to be supplemented by the writings of Adams, Fiske, Harrisse, Markham, Prescott, Thacher or Winsor.

Colum'bus, Georgia, a railroad center at the head of navigation on Chattahoochee River. It has wonderful waterpower, aggregating 136,000 horsepower at and above the city, 27,000 of which is already developed and in use. It is a large manufacturing center, having 16 cotton-factories, 6 large fertilizer factories, two large iron-mills, two flour-mills, clothing-factories, the largest show-case factory south of the Potomac and a variety of industrial establishments, including cotton compresses, woolen mills and wood-working plants. There are also many large factories just beyond the city limits. It has an excellent school-system, providing for all children from kindergarten to college. The latest addition to its school-system is the secondary industrial school which is an academic trade-school of high-school rank. According to the census of 1900, the population was 17,614. It has had a steady growth of recent years, and its population by latest census is placed at 21,805.

Columbus, Ind., a city and county-seat of Bartholomew County, situated on a branch of White River. It has flour and starch-mills, and manufactures agricultural implements, furniture and cerealine. It has the service of the Big Four and Pittsburg, Cincinnati, Chicago & St. Louis railroads. Population, 8,813.

Columbus, the capital of Ohio, is situated on the Scioto River, a little south of the center of the state. It is a city of broad streets and large parks. The fine capitol and the United States and board-of-trade buildings are among its main structures. It contains an insane hospital, state penitentiary and asylums for the blind and deaf and dumb. There are 38 public-school buildings, four of them high-schools, and they have more than 20,000 pupils. Among the higher institutions are Capital City University, Ohio State University and St. Mary's Academy. Besides, there are three medical colleges, a dental college and five public hospitals. There are several parks and 40 or more churches. Natural gas is used for domestic purposes, and there is an unlimited supply of bituminous coal near the city. Columbus is an important manufacturing city, possessing steel-plants, blast-furnaces and malleable-iron works, and making cash-registers, agricultural implements, automobiles, all varieties of vehicles and shoes, gloves and clothing. Its public buildings in number and cost are not excelled by any city of the country, except Washington. Columbus was laid out in 1812 and incorporated in 1834. It has been the state capital since 1816. Eighteen railroads and its nearness to the Ohio coal-and iron-fields have done much to increase the growth of the place Population, 181,511.

Columel'la (in plants), an axis of sterile tissue which passes through the center of the spore-case of mosses. See MUSCI.

Coman'ches (*kō-măn'chĕz*), a tribe of Indians of the Shoshone family. They do not live in villages, but, carrying their skin-lodges with them, roam over the country. When first found by the French in 1719, they hunted from the head-waters of the Brazos and Colorado to those of the Arkansas and Missouri. They are great hunters, riders and fighters, and are divided into eight bands. They had long and bloody wars with the Spaniards, were at one time on a reservation in Texas, and later some of them were in the Indian Territory. They have medicine-men, and worship as their god Niatpol (meaning "my father"). Years ago, they numbered 10,000 or 12,000, filling up their ranks with Mexican captives. They now number some 1,500, and are chiefly settled now in Oklahoma.

Com'edy. See DRAMA.

Com'ets, the name given to those large and more or less bright bodies which now and then enter the solar system, sweep around the sun, and again return to more distant regions of space where they become invisible as before. In general comets are composed of three parts. First, there is a luminous cloud, the *coma*, from which these bodies take their name. In its center is generally found a brighter *nucleus*, the part which the astronomer observes when he determines the orbit of the comet. Thirdly, there is the *tail*, which is a great streamer of light, following the comet as it approaches the sun and preceding the comet as it leaves the sun. Considered with respect to their brightness, comets may be divided into two classes: *telescopic* comets and *naked-eye* comets. By far the greater number belong to the first class and can be seen only by the aid of a telescope. Considered with reference to their orbits, comets may be divided into three

classes: (1) those whose orbits are elliptical; (2) those having parabolic orbits; and (3) those having hyperbolic orbits.

Nearly all comets appear to move along a parabola, having the sun at the focus; some 20 per cent., however, of those studied move in elliptical paths. Since a parabola is a curve which has two branches extending off to infinity, we do not expect ever to see again a comet which has a parabolic orbit. But an ellipse is a closed curve, and accordingly some of those comets having elliptical orbits have been observed many times.

NATURE OF COMETS

Concerning the composition or structure of comets very little is known, and that little has been learned almost entirely from the spectroscope. This instrument shows that a very small portion of the comet's light is reflected sunlight. The comet shines by its own light, giving a spectrum which is described as follows by Professor Young of Princeton:

"The spectrum of most comets consists of a more or less faint continuous spectrum (which may be due to reflected sunlight, though it usually is too faint to show the Fraunhofer lines) overlaid by three bright bands,—one in the yellow, one in the green and the third in the blue. A fourth band is sometimes visible in the violet. The green band, which is much the brightest of the three, is in some cases crossed by a number of fine, bright lines, and there are traces of similar lines in the yellow and blue bands. This spectrum is absolutely identical with that given by the blue blaze of an ordinary gas or candle flame; or, better, by the blue flame of a Bunsen burner consuming ordinary illuminating gas. Almost beyond question it indicates the presence in the comet of some gaseous hydrocarbon, which in some way is made to shine; either by a general heating of the whole body to the point of luminosity (which is hardly probable), or by electric discharges within it, or by local heatings due to the action of sunlight; or none of these surmises may be correct, and we may have to seek some other explanation not yet suggested.

It therefore, on the whole, appears highly probable that comets are bodies made up of small discrete particles.

One great mystery in connection with these bodies is the fact that the tail is repelled by the sun But recently the Swedish physicist, Arrhenius, has given an explanation of this fact, which is quite plausible. He bases his explanation upon the fact, discovered by Maxwell, that a beam of light exerts a pressure in the direction in which the light is traveling and that the amount of this pressure is numerically equal to the amount of energy, in unit volume, of the beam of light. If, now, the particles of which the comet is composed are very small, they will present a surface which is very large compared with their mass. Since this pressure increases very rapidly as the comet approaches the sun, it is an easy matter to compute, for particles of any given size, just how near the sun they must go in order that this repulsive pressure due to sunlight may equal the gravitational attraction of the sun for the particle. If the comet should come nearer the sun than this limiting distance, repulsion will ensue. Or at any given distance we can easily compute the size which the particles must not exceed in order to be repelled by the sunlight. This explanation is quite is accordance with the results obtained by means of the spectroscope.

REMARKABLE COMETS

In recent times the most brilliant comets are those of 1858 and 1882. The former is known from its discoverer as Donati's. To the astronomer no comet has more interest, perhaps, than that of Halley (1682), whose return to the solar system in 1759 was predicted by its discoverer. The comet actually returned, as predicted, and in 1835 returned for a second time. Its next return occurred in 1910. Encke's comet is also one of great interest, returning every three and one-half years. See Miss Clerke's *History of Astronomy during the 19th Century*, Chaps. 5, 10 and 11.

Commerce. The idea of commerce is a part of the idea of property, and property implies that a thing has value to oneself and also to others. In commerce there is an exchange of property, in which each party gains what he desires. But commerce is no longer the mere *barter* of savages. It is a vast system in which all the world shares. It helps to make prices and wages more equal. It also keeps them more fixed, for, if one group will not pay a fair price, the goods may be sent elsewhere. It gives a very wide market, so that a country may now produce more butter or meat than it needs, and yet sell all of it by sending the surplus abroad. It brings people all over the world into greater sympathy with each other, and gives them more knowledge of each other. Thus a failure in the cotton-crop of the southern states has been the cause of almost a famine in Lancaster, England, where much of the cotton is made into cloth. Commerce is favored by a large coast-line and good ports; for it is cheaper to carry goods by water than by land. It depends partly upon soil and climate and the presence of iron and coal in a country; partly, too, upon the cheapness of labor; but more largely upon freedom and security, industry and ease of communication.

So far as is known, the Arabs were the first great overland traders. The Phœni-

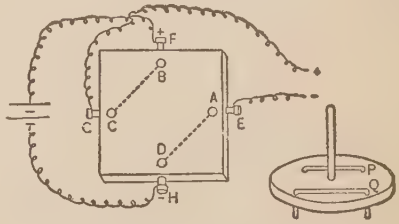
cians, however, a nation of traders whose home was on the strip of coast that lies about Tyre and Sidon, were the first merchants to plan and execute great voyages by sea for the sake of trade. Their ships roved even to the Atlantic and the distant shores of Britain. The Greeks also were great traders; and Carthage, a Phœnician colony, became so powerful and wealthy through her commerce that it required all the might of Rome to humble her in the dust. In the middle ages the great trade between Asia and western Europe lay chiefly in the hands of the merchant republics of Venice and Genoa. But so soon as the route round the Cape of Good Hope to India was found and the new continent of America also came to attract the eye of the European trader, commerce centered in the nations of the Atlantic rather than of the Mediterranean. At first Spain and Portugal, and afterwards England and Holland became the great world-traders. In the latter part of the long strife of England and France for colonial empire the United States, having won their independence, became the great neutral carriers of merchandise.

The extent to which commerce grew in the nineteenth century is almost beyond belief. It was favored greatly by the invention of the telegraph, the success of ocean-cables (q.v.) the building of railroads and the invention of steamships. It was only in 1819 that the first steam-vessel crossed the Atlantic Ocean. In England in 1800 the imports were valued at under $29,000,000; in 1900 at over $523,000,000; while the exports in 1800 were valued at under $35,000,000; and in 1900 at over $354,000,000. Or take the commerce of the United States in the second half of the nineteenth century. Whereas in 1850 the exports and imports together amounted to $318,000,000; in 1900 they amounted to no less than $2,244,000,000 in estimated values, while in 1907 they amounted to $3,315,272,503.

Commons, House of (English). See PARLIAMENT.

Com'mune of Paris (*kŏm'mūn*). Commune is the unit or lowest political division of France, corresponding to the American township. The rising of the Commune of Paris, in 1871, should not be confounded with communism, with which it had nothing to do. It was a revolutionary attempt to establish self-government for Paris. The theory of the rising was that every commune should have self-government and that the state or central government should be merely a federation of communes. The movement was caused by discontent in Paris, where the people found themselves in possession of arms after the siege by the Germans. The rising occurred on March 18, 1871, and was put down only after 10 weeks' long and bloody fighting between the forces of the commune and a large army of the central government. Sixty-five thousand communists fell during the last ten days in May.

Com'mutator. In most kinds of electrical work it is necessary at times to change the direction of the current in some part of the circuit. The commutator is an instrument for producing this change. The device represented in the accompanying figure is typical of all commutators. The block A, B, C, D is made of wood, and has four holes bored about half-way through it. These holes, placed one at each corner of a square, act as cups to hold mercury



A TYPICAL COMMUTATOR

Into the sides of the block are inserted four wires, E, F, G, H. Each of these wires connects with the mercury in the cup nearest it. The poles of the battery are joined to two diametrically opposite cups, say B and D; the wires from the rest of the circuit, say from a galvanometer, are joined to the remaining two cups, A and C. For closing the circuit two short, thick, copper conductors, P and Q, are mounted on a movable block, as shown in the figure. These connectors, P and Q, may be placed in the mercury cups in such a way as to connect B with A, and hence C with D; or they may be placed so as to connect B with C, and hence A with D. In the one case the current flows from G to E through the galvanometer; in the other case from E to G. To change the direction of the current in the galvanometer circuit, we have, therefore, only to lift the top block and rotate it through 90° in either direction. Such an instrument is called a commutator.

In many kinds of electrical machinery the commutator is made to work automatically. Thus, in the case of the dynamo, the currents which are generated in the coils of the armature are alternating, but a commutator is in many instances placed on the shaft of the armature, which automatically reverses the connections of the armature-coil and the external circuit, so that the current in the external circuit always flows in one direction. Such a dynamo is called a direct-current generator. The dynamo which is not provided with a commutator is called an alternate-current generator.

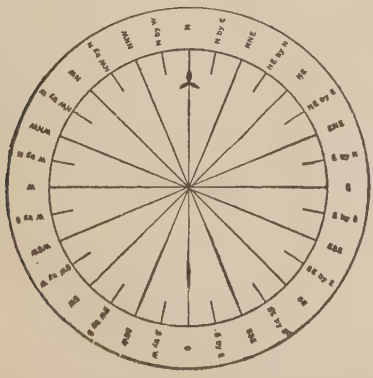
Como (*kō'mō*), **Lake,** is situated in northern Italy, at the foot of the Alps. It is 30 miles long, and its greatest width is two and one half miles. The fine climate and the beauty of the scenery of its shores have made it the most popular resort of any lake in Italy and its shores are lined with handsome villas.

Comoro (*kŏm'ō'rō*) **Islands** or **Comores,** lie in the Mozambique Channel. They have been French since 1886, and are administered by the governor of Réunion Island, who appoints a resident for Great Comoro and another for Moheli and Anjuan, which with a number of islets make up the group. The total area is about 620 square miles, with a population of 47,000, nearly all Moslem. Each island has its own budget, and all are self-supporting, sugar and vanilla being successfully grown and coffee and cloves under development. An important coaling station is situated here.

Comox. The northern part of Vancouver Island (British Columbia). A part of the opposite mainland is called Comox district. The two contain 4,000,000 acres. The district is very rich in minerals and timber. Considerable fertile land is found between Comox Bay and Campbell River. The Esquimault and Nanaimo Railway will go through the district. Along the deeply indented coast-line the fishing industry is being developed on a large scale. The whole district is very rich in fertile belts, minerals and timber.

Compass (*kŭm'pas*), **Magnetic,** an instrument for indicating the direction of the magnetic meridian. The importance of this determination lies in the fact that, if we know any one fixed direction, such as this magnetic meridian, it is easy to locate any other direction by the use of a graduated circle. In this way the direction of a line-fence or the course of a vessel may be easily described.

The three parts of a mariner's compass are (1) a freely suspended steel magnet; (2)



a card attached to the magnet and moving freely with it; and (3) a compass-box, in which the needle and card are so mounted as always to remain level, however the box may be tilted.

The free suspension of the needle is generally obtained by attaching to it a cap of agate or ruby, which rests on a hard, sharp point.

Practically all the compasses now used on ocean-going vessels are of the type devised and patented by Lord Kelvin in 1876. The magnet is built up of eight or ten small magnets placed some distance apart but parallel to each other. Since the greater part of the mass is thus placed at considerable distance from the axis of rotation, the Kelvin needle is very steady.

For many centuries—at least since the time of Chaucer (1391)—the compass-card has been divided into 32 equal angles called points. Each point is evidently equal to $11\frac{1}{4}°$. The names of these points are indicated in the accompanying figure.

In the surveyor's compass the needle swings freely over a circle divided into degrees and provided with a pair of sights. When these sights are so placed that the line joining them lies in any desired direction, the end of the compass-needle indicates at once the angle which this desired direction makes with the magnetic meridian.

The origin of the compass is lost in obscurity. About 1200 A. D. it was commonly used on the Syrian coast, and it is said that Marco Polo in 1260 brought the knowledge of this Chinese invention to Europe. Gioja of Amalfi, Italy, improved the instrument about 1320. Its variation was known long before Columbus noticed it.

Compass-Plants. The ordinary position of a leaf is approximately horizontal. In regions of intense sunlight and dry air, however, certain plants have learned to turn their leaves edgewise. This is called the profile position, and by means of it one edge of the leaf is turned upward toward the most intense light, and thus the leaf avoids too great drying out. The flat surfaces of the leaves thus face the morning and evening rays of light, which are rays of less intensity than those of midday. As a consequence, the leaves point either north or south, and hence such plants were called compass-plants. The rosin-weeds (*Silphium*) of the prairies and the common prickly lettuce (*Lactuca Scariola*) of waste grounds everywhere are among the most notable of the compass-plants. The profile habit is common in the dry regions of Australia, giving to their vegetation a very peculiar appearance.

Compos'itæ, the greatest family among seed-plants in point of numbers and in rank. They form one tenth to one seventh of the seed-plant vegetation of almost all regions. Among them are the asters, goldenrods, rosin-weeds, sunflowers, chrysanthemums

thistles, daisies, ragweeds, sage-brush, lettuce, dandelion and others. They are characterized by the fact that their numerous small flowers are closely packed together in heads which resemble flowers. The sunflower, for example, is a head of very many small flowers, the head being surrounded by a set of bracts known as the involucre, which resembles a calyx. The outermost flowers develop showy petals, and thus resemble the petals of an ordinary flower. Another peculiarity of the family is the transformation of the calyx into the so-called pappus, which commonly, as in the thistle and dandelion, takes the form of a tuft of fine hairs for transporting the seed-like fruit (*akene*).

Composition in Fine Art. In the essay upon the fine arts it is shown that the essential quality in a work of art is the power of bringing about a certain repose in the mind of the person who is contemplating the work. Hugo Münsterberg observes this in defining the mission of art instruction: "To bring into every life the ideal repose, the repose in the ideal; to bring us that rest which is not fatigue from work, nor the rush of amusement; no, rather that rest which is complete satisfaction beyond the struggles of the day, complete harmonization of all our energies, complete fulfillment of our real personality."

A work of art, in order to give this complete repose, must have but one theme; it must be free within itself from conflicting attractions or suggestions; it must, in other words, have *unity*. Whether it be a sonnet, sonata, picture, vase or cathedral, it must give one impression. That impression may be simple, as is that given by the architecture of the California missions: it may be complex, as is that of St. Mark's cathedral in Venice; but it must be *one*. It may be grand, as in the sculptures of Michelangelo, or it may be delicate, as in the carvings of the Japanese, but it must be an *unconfused* impression. It may be brought about by combining many similar forms, colors, lines or suggestions until they add power to one another, as in some of the poems of Joaquin Miller — giving that quality which we call harmony; it may be brought about by leading the attention to an unlikeness in certain related things, as in Keats's sonnet *The Grasshopper and the Cricket*, producing a contrast; but in either case a single impression must result.

Now, it will be clear that nature does not always exist in perfect harmonies or perfect contrasts. Nature indeed has other business in hand than the forming of perfect pictures. If he would produce pictorial beauty, the artist must make many a change in the "landscape with figures amid which we dwell." Let us review some of the demands upon him in this respect.

When, in looking over the fields, we send our glance from the trees to the hills beyond them; when we remove our eyes from a person to whom we are speaking, to the walls just behind him; when, in fact, we leave off looking at any one thing and look at something either farther away or nearer than that at which we were looking before, our eyes change their focus for the occasion in somewhat the way in which the focus of a camera is changed to suit varying distances. The eye, however, is by far the more subtle instrument, and is sensitive to variations of distance which would make no apparent difference to the camera. It may therefore be said that each thing we see in nature is, when it is being seen, the center of a little picture all its own and that it is the sum of a number of these little pictures which gives us our impression of "all outdoors." Now, if the artist were to try to paint in one picture the hills as he sees them when looking directly at them, the trees as he sees them when looking directly at them, the clouds as he sees them when looking directly at them, he would have a picture with as many separate interests as it contained objects—a picture which could never have unity or give repose of any sort. So the artist must select some one thing for the main theme of his picture, and to this he must subordinate all other things which may occur in it.

A study of great paintings and illustrations will show the various ways in which artists accomplish this suppression of the secondary things and emphasis of the important ones. It will show that a figure may be made prominent by the position it occupies on the canvas, by its relations to other figures, by its having a space of comparative quiet around it (notice the effect of the halos around the heads in the old-master paintings of the saints), by the focusing of many important lines upon it or the introduction of a contrast near it, by its being more minutely drawn and finished than the rest of the picture, and by the suppression of other figures or groups of figures through partially hiding them from view, turning them away from the spectator, causing them to look or point toward the principal figure or throwing them into a subdued tone.

In nature it is sufficient if the form of a tree be beautiful against the sky; in a picture the visible shapes of sky seen through the tree must be equally beautiful. The picture, since it is all to be seen at once, must be a beautiful pattern in which every shape involved is fine, the background spots not in any sense being left-overs from the shaping of the motif-parts; rather, being conceived in the same æsthetic spirit which characterizes those parts. The contours which distinguish tone from tone may

Dance of the Nymphs—*Corot*

THE FIGHTING TEMERAIRE—*Turner*

not fall merely anywhere, but only in such ways that tone and tone and interest and interest shall be fairly held at pleasing intervals. Consistency of character, which has been called harmony, consistency of attractions, which has been called balance, and consistency of movement, which has been called rhythm shall keep all elements of the work together in an integral whole. Here again the artist in forming his work must exercise his æsthetic judgment, varying from nature's appearances, if need be, to bring finer proportion into his work, to give it more perfect unity.

The beauty of a picture or a piece of music does not lie in a pleasing of the sense alone. Perhaps it is impossible for the sense to be engaged at all without the mind receiving some deeper message through it. It is this fact which causes us to observe in another place that art is a sort of language. But the message which that language has to deliver is not an intellectual one. It is not primarily for the rehearsing of facts that art exists. The message which a picture has to give, like the message which music has to give, comes to us in the form of an experience, a mood which the work awakens within us—not a story which the thing can tell us. A Bokhara rug may be of "sleepy coloring" and give us the repose of twilight as we contemplate it; a clear melody may give us the same feelings as a view from a mountain-top; a dash of thrilling color may be to us like a battle-hymn. Such are the messages we may receive from pictures and music if we but will, instead of the story that "here is a man and he is doing so and so." These are the feelings which come to us straight from the heart of the artist himself, even though he be centuries in his grave; the tree, the figure and the incident which the work involves are merely the words by which the message is conveyed.

For some reason music in a minor key is apt to make us sigh. For some like reason certain kinds of lines or movements in a picture give us certain emotions. Perhaps it is because these lines or movements recall associations which stamped themselves upon the impressionable childhood of the race. The ridges of the sea which we call waves and the grander ridges of the continents which we call mountains have had their common origin in the war or play of the elements—in activity rather than in quiet. The risings and fallings of the waves and the mountain-ranges, the high, straight stems of those still forests amid which generations of our primitive ancestors spent the long days and the mysterious nights, the long flat reaches of the sea when it is calm and of the desert and of the clouds in a quiet sky—all these things have been seen and watched for ages; nor is it to be wondered that the lines which we see in them, the movements which we feel in them, have come to call up the same feelings which these things themselves called up.

Let us look at Corot's landscape *Morning*. It has come to be called *The Dance of the Nymphs*. Is this because there is a group of tiny figures at the bottom—who in truth are scarcely dancing and who may hardly be called nymphs? Or is it because of the witchery of that great movement which takes us from the bottom up into the picture, across the top and down the other side, lastly circling round and round the bit of sky in the center, leading us, before we know it, in an airy dance through the tree-tops? The little figures give the keynote—they form a statement of the theme, Morning, Happiness, Dancing, but even if they were suddenly to whisk themselves out and disappear on the other side of the tangled shrubbery, the movement of the picture would still go on, and it would still be a dance of the nymphs.

For a contrasting mood see Turner's great picture, *The Fighting Temeraire*. What is there about this picture to show us that this ship is the old hero of England's battles that she is,—or to tell us that she is being towed away for breaking up? And yet Ruskin says that, of all pictures not visibly involving human pain, this is the saddest. What has the artist done to make us feel the solemnity of this occasion? We see a sheet of still water under a great, bending, sunset sky. On the other side a tall ship is coming up, towed by a black tugboat. Long ripples are thrown to left and right, and thin smoke pours back from the funnel of the tug. Shadows are gathering from all sides, and there are the buildings of a great city beyond in the gloom. Study the use of lines. Are they like those merry ones that circle round the canvas of Corot's *Morning*? Or are they the lines which we see in the solemn groves of pine or cypress, in the desert and in the great cathedrals? Are they not like figures in a funeral march? Has the artist accepted nature only as he found her?

We have shown the three principal considerations which compel an artist always to turn away more or less from the copying of nature. Of all these, doubtless the last one which we have touched is the deepest, the one determining the trend of the whole work,—the consideration of *expression*. Intimately related to that one is the second—the consideration of *absolute beauty*; and the third is that one which deals with the *translation of the three-dimensional aspect of nature into the two-dimensional limits of a picture*. We have spoken of the lines and colors and objects of nature as the artist's alphabet and vocabulary. Were he to devote his time merely to copying the things which nature sets before him, he

would be practicing only the handwriting of his art. The considerations which we have enumerated above give him a grammar and a composition—the power to express himself—the power of being understood.

The process of selecting, arranging, subduing and accenting the forms, tones, colors, movements and interests of his work, so that they will produce the mood or set forth the idea which he is endeavoring to present, so that they will give unity and through it the "perfect repose"—this the artist calls composition.

GEORGE WILLIAM EGGERS.

Compressed Air. The first scientific knowledge of the power of air was gained in the sixteenth century by Galileo. Air under pressure increases in density and heat, and exerts an increased power in every direction. Hence compressed air is applied in locomotives; and its power is employed in many machine-plants, such as those of mines and water-works. An air-compressor or air-pump is a cylinder fitted with a piston and rod, and with valves at which the free air may enter and with others at which the compressed air may be applied, together with the needful connections of this apparatus with the driving power. In most compressed air "plants," the pressure which is employed is about 80 pounds to the square inch. Air may be liquified at a temperature of 312° below zero. This temperature may be got under a pressure of 1,200 pounds or upwards to the square inch; but the process is thus far not profitable from a commercial standpoint, although there are several ways in which liquid air may be applied.

Compromise of 1850, a measure designed by Henry Clay and, largely through his efforts, adopted by both houses of Congress in August, 1850. Its chief purpose was to satisfy the conflicting demands of the north and the south in the matter of slave and free territory. The leaders for the south were attempting to have the recently acquired Mexican domain organized into states all of which should permit slavery (The Clayton Compromise); were trying to have the Missouri Compromise line extended through to the Pacific; were backing Texas in her demand either for a money indemnity or the Rio Grande as a western boundary; were demanding an effective fugitive-slave law; were demanding that no free state should be admitted unless paired with a slave state. The leaders for the north were backing California's demand to be admitted as a free state; were attempting to have slavery abolished in the District of Columbia; were seeking to prohibit interstate commerce in slaves; were justifying the personal-liberty laws which made just about useless the fugitive-slave law; were resisting the demands of Texas. There was a deadlock, and to many civil war seemed certain. It was at this juncture that Clay introduced his compromise. In one form or another it was debated for nearly five months, but was finally passed about as Clay had designed it. It provided that California be admitted with her free constitution; that there should be no slavery prohibition in the organization of territorial governments founded in the Mexican domain (which included the territories of New Mexico and Utah); that Texas should receive her indemnity; that slaves might be held in the District of Columbia; that there should be no slavetrading in the District of Columbia; that the fugitive-slave law should be enforced; and that the interstate slave-trade should not be interfered with. Passed to avert a clash at arms, the measure was one of the shortest-lived and least successful compromises in history. The fugitive-slave law in its operation rapidly turned the whole north into abolitionists, and so hastened the passage of the Kansas-Nebraska bill which made the whole compromise a dead letter.

Com'stock Lode, a ledge of silver to which Virginia City, Nev., largely owes its growth. Discovered in 1859, the lode has yielded at times over $10,000,000 yearly. The shaft is 2,300 feet deep; but work is now only done on the upper levels, the workmen having been driven from the depths by the great heat (120° F.) and by the suffocating gas produced by the action of the air on the sulphurous rock cut at different levels.

Comte (*kônt*), **Auguste,** was born Jan. 19, 1798, at Montpellier, France. In philosophy he was for six years a pupil of St. Simon. In 1826 he began lectures which grew into his treatise on positive philosophy. He is the founder of that school of philosophy called positivism. Comte died at Paris on Sept. 5, 1857.

Comus, a masque by Milton, contains perhaps the most beautiful and tender appreciation of the beauty of purity and holiness which is to be found in all poetry. Its moral is:

"Mortals, that would follow me,
Love virtue; she alone is free;
She can teach ye how to climb
Higher than the sphery chime;
Or, if virtue feeble were,
Heaven itself would stoop to her."

Comus, the god of revel, is not mentioned in the classical myths; but in the 3rd century A. D. he is referred to in connection with art. In Milton's poem a maiden, parted from her brothers in the wood where Comus holds his revels, is saved from the swinish cup which is offered to her by her own constancy and innocence. Among the greatest lines are these:

"So dear to Heaven is saintly chastity,
That, when a soul is found sincerely so

A thousand liveried angels lackey her,
Driving far off each thing of sin and guilt;
And, in clear dream and solemn vision,
Tell her of things that no gross ear can hear;
Till oft converse with heavenly habitants
Begins to cast a beam on th' outward shape,
The unpolluted temple of the mind,
And turns it, by degrees, to the soul's essence,
Till all be made immortal."

Conchology. See SHELLS.

Con'cord, a town of Middlesex County, Mass., 23 miles by rail from Boston. It was settled in 1635. As early as 1767 its people took a strong stand against the measures of the British. In February, 1775, the colonial government gathered valuable military stores at Concord. British spies visited the place, and an expedition from Boston to seize or destroy the stores was decided upon by General Gage. On the morning of April 19, 800 soldiers reached Concord. The country had been thoroughly alarmed; the people were engaged in concealing stores; and the militia, to the number of 180, had gathered when the enemy came in sight. Some were for resisting them, but, desiring to throw the blame of the attack on the invaders, Colonel Barrett led his men across the North bridge. While part of the British were destroying arms and provisions, a detachment marched to secure the North and South bridges. The Americans, believing the enemy were burning the village, marched toward the bridge, while the British drew up on the east bank and began to pull up the bridge-planks. They were commanded to stop, which they did; but a single gun, followed by a volley, was fired at the Americans. The minutemen answered with a volley also, and a general fusillade ensued, both sides losing several men. The British retreated to the center of the town, the Americans following and posting themselves along the Boston road. About noon the retreat began, the minutemen pursuing the British as far as Lexington. The Revolution was really begun by the skirmish at North bridge, where, as Emerson puts it, was "fired the shot heard round the world." Concord, out of a population of 1,300, sent 174 men to the army of 1775, the town raising the soldiers' pay. Concord is noted as the home of Hawthorne, Emerson, Thoreau, Louisa M. Alcott and Channing. Population, 6,421.

Con'cord, the capital of New Hampshire, is on the Merrimac River and has some handsome public buildings. The city has extensive water-power. It manufactures large numbers of carriages, also shoes, twine, leather-goods, silverware, electrical apparatus, machine-shop products; and has quantities of fine granite in its vicinity. An island in the Merrimac near the city is famous as the place where Mrs. Hannah Dustin and her nurse, with the aid of a boy, in 1697 killed ten Indians who had taken them captive. Concord was the home of the Penacooks, a powerful tribe of Indians. It was settled in 1725. Population 21,497.

Concordat, The, of 1801, was an agreement between Pope Pius VII and Napoleon as first consul of France. This is the most famous of many such concordats between the popes and secular rulers. By the concordat of 1801 the national Catholic church was restored to France, though its administration was henceforth more dependent upon the government. Church property which had been seized was not to be restored, but the government was to provide for the support of a reduced number of bishops. As in English history of old, it was agreed that the government should select the bishops, but the pope invest them with their office. This concordat was replaced by similar agreements under different French governments. But there always was a strong party against having any state-church; and in 1906 it was disestablished and the concordat repealed.

Concrete, a composition of broken rock, gravel, broken bricks, sand, etc., usually cemented into solid form by the use of hydraulic cement. The proportions of the various ingredients differ according to the use to which the artificial stone called concrete is to be put, but the principle to be kept in mind in the mixing is that there should be enough of the mortar to a little more than fill the space between the fragments of broken rock, etc. A typical concrete is made of one part of cement, three parts of sand and five parts of broken rock. The mixing is usually done dry, only enough water being used to lay the dust, but more water is added when the stuff is tamped into position. Where concrete has to be laid down under water, it is usually put in position in bags. It is used for the foundations of structures of all sorts, for piers, fortifications, sidewalks and, recently, to a great extent in monolithic buildings, that is, buildings that are virtually one stone. In such buildings, as well as in many foundations, many iron girders and rods are imbedded in the concrete to add to its strength, and this is called reinforced concrete. The great earthquake in California made apparent the superiority of this kind of construction. Concrete was used extensively by the Babylonians, Egyptians, Greek and Romans. Some of their buildings have stood over 3,600 years. See CEMENT.

Conde (*kôn-dā'*), **Louis II of Bourbon, Prince of,** called the Great Condé, was born Sept. 8, 1621. He early started in his soldier's career. At the age of 22 he was given command of a French army

and, against the advice of older generals who served under him, he fought the battle of Rocroi, and by skillful maneuvering and fierce charges made it a brilliant victory—the first in the reign of Louis XIV. Two hard-won victories in Germany and the capture of Dunkirk were followed by his winning the important battle of Lens in 1648, in which the formidable Spanish infantry were destroyed and the Thirty Years' War ended. The next year began the war of the Fronde, and, though Condé by his generalship had placed the young king on the throne, his pride had made him enemies at court. Soon after he was arrested, and, when set free, he at once put himself at the head of the troops of Bordeaux, which had rebelled. But he was no longer successful. Turenne defeated him twice; and, forced to leave the country and now fighting in the Spanish army, he was again overcome by the same general. Eight years afterward, having been allowed to return to France, the death of Turenne again brought him to the front. In three weeks he conquered Franche-Comté and fought William of Orange, (William III of Holland and England), though in a drawn battle which lasted for 17 hours. This was his last engagement, as the campaign had broken his health. He died Dec 11, 1686.

Condor, a very large bird of prey, living in South America, usually among the peaks of the Andes. It at one time was considered the largest bird of prey, but several species

CONDOR

of the Old World are larger, and the Californian vulture reaches the same size. Before they were actually measured by Humboldt, fabulous stories were told in regard to their size and carrying-power. They were said to reach 30 or 40 feet in stretch of wing and to carry away sheep and children in their claws; but the toes are comparatively straight and the claws are blunt and not fitted for grasping. There is no authentic case of animals having been carried away by the condor. This structure of the foot makes it difficult for them to perch on trees and they prefer the bare rocks. They are sound sleepers, and may be caught with a noose while roosting. The plumage is a glossy black, with broad white bars across the wings and a collar or ruff of snow-white down around the neck. The latter is naked, and covered with wrinkled dull-red skin. They feed mostly on carrion, but are also fond of fresh meat and kill lambs, the goat and the young of cattle and deer. The white eggs are laid on inaccessible rocks, and the young cannot fly for about a year. They continue to hunt and roost with their parent for two years longer. Their plumage is brownish, and they have been called brown condors.

Conduction (in plants). See WATER, ASCENT OF.

Cone (in plants), the characteristic cluster of seed-bearing scales developed by conifers and especially by the pines and their allies. The technical name of such a cluster is strobilus. See CONIFERS.

Co'ney Island, southeast of Long Island and barely separated from it by a rivulet, is a narrow strip of sand, five miles long and half a mile wide. It has a fine beach, which is lined with long rows of huge wooden hotels. Its nearness to New York and Brooklyn makes it a popular resort. The east end is called Manhattan Beach, and its broad hotel-verandas, promenades and well-laid-out grounds are patronized by the well-to-do. There are two large music-halls, with fine acoustic properties, the galleries open to the air, where the best musicians of New York give cheap summer-concerts. The west end is the most democratic resort in America, and its beach, bathing-pavilions, open-air restaurants and music-halls, toboggan-rollers and iron lookout-tower, 300 feet high, are crowded all summer by thousands of the ill-housed and sweltering men, women and children of the cities. Steamboats land every few minutes during the day at the tubular iron pier, 1,000 feet long; three railroads join Coney Island to New York and Brooklyn; and one surface and one elevated road carry the pleasure-seekers from one end of the island to the other.

Confed'erate States of America, The. When the Republican or antislavery party gained control of the government, by the election of Abraham Lincoln to the presidency, certain of the slave-states took

steps to withdraw from the Union and establish a separate government. A convention assembled at Columbia, South Carolina, Dec. 17, 1860, but adjourned on the same date to Charleston, where, on the 20th, a resolution was passed declaring that the union hitherto existing between South Carolina and the other states under the name of The United States of America was dissolved. Other states were quick to follow. In less than six weeks Mississippi, Florida, Alabama, Georgia, Louisiana and Texas passed ordinances of secession and withdrew from the Union. On the 4th of February, 1861, delegates from six of these states met in convention at Montgomery, Alabama, and organized a new government, with the title of The Confederate States of America. On the 8th of the same month, the organization was completed by the choice of Jefferson Davis of Mississippi as president and Alexander H. Stephens of Georgia as vice-president. The seceded states at once seized, with few exceptions, all the forts, arsenals, navy-yards, military stores and other Federal property within their limits.

The Civil War followed, beginning with the attack on Fort Sumter on April 12. On the 17th Virginia seceded and joined the Confederacy. Arkansas followed on May 6, North Carolina on the 20th of the same month and Tennessee on June 6, making 11 states in all. The history of the Confederacy is confined to the years of the Civil War, and it ceased to exist with the surrender of the Confederate army at Appomattox, Va., April 9, 1865.

Confu'cius (*kon-fū'shē-us*), the great Chinese sage, was born in the state of Lu, in 551 B. C. His father, an old soldier, died when Confucius was three years old, leaving him and his mother very poor. For a while he had charge of the public stores and the public herds. At 22 he began his career as a teacher. In 501 a new ruler made him governor of the town of Chung-tu, where he brought about a striking reformation in the manners and morals of the people. Soon after, he became a minister of state and the most powerful man in Lu. For three years he was as successful in ruling and reforming the people as he had been when only a town-governor. Under his rule dishonesty was unknown; loyalty and good faith were the characteristics of men. Confucius was now the idol of the people. But soon a breach was made between him and his ruler, and for 12 years, with a company of disciples, he traveled through other Chinese states, teaching as he went. Sometimes the company were welcomed by high princes; at others they had not enough to eat, and even were in danger of their lives. A new ruler summoned the sage back to Lu, where he died the eleventh day of the fourth month, 479 B. C. Confucius thought his life a failure, but he was hardly dead when a temple was built in his honor, and to-day every market-town has its Confucius temple, and twice a year the emperor does honor to the greatest and wisest of Chinese philosophers. Of no ancient person do we know more than we do of Confucius. Not only what he taught, but just how he looked and acted at court, while talking to his disciples, at his table or in his bed has been handed down to us. Confucius was a great moral teacher and his supreme teaching was his negative golden rule: "What you do not wish done to yourself, do not do to others." He never pretended to be anything more than a man, but he knew the right way for each man to live and to be right himself, and for the ruler so to rule as to make men happy and good. China is his monument.

Congo Free State grew out of the International Association, which was formed in 1878 with King Leopold of Belgium at its head. The European powers recognized the state in 1885, and in 1890 its territories were declared inalienable, though a convention between Belgium and the Independent State reserved to the former the right of annexing the latter after a period of ten years. In 1901 this right was renewed, and in 1908 the annexation took place, chiefly owing to the desire of the Belgian people to protect the natives who, under the selfish rule of King Leopold of Belgium, had been treated as his private property and most cruelly worked and abused.

The Congo Free State has a narrow seacoast, with the Congo as its northern boundary, and in the interior widens north and south, extending to Lakes Albert Edward and Tanganyika. The people of the Congo basin are of the Bantu race. They are harmless, and born traders, and are lighter in color than the Sudanese. The European population numbers 3,399, chiefly Belgians, Portuguese, Italians, English and Americans. The chief districts are Boma, Bangala, Aruwimi, Lualaba, Kwango, Equator, Ubangi and Stanley Pool. The area is estimated at 900,000 square miles and the population at 15,000,000 or 16,000,000.

The chief imports are fabrics, food, machinery, steamboats, drink, metals, arms and ammunition; the exports consist of rubber, ivory, palm-nuts and oil, coffee and cocoa.

The forests from which the rubber comes were graphically described by Livingstone (*q. v.*), and the description still holds:

> Into these primeval forests the sun, though vertical, cannot penetrate, except by sending down at mid-day thin pencils of rays into the gloom. The rain water stands for months in stagnant pools made by the feet of the elephants. The climbing plants, from the size of a whipcord to that of a man-of-war's hawser, are so numerous, that the ancient path is the only passage. When one of the giant trees falls across the road, it forms a wall, breast high, to be climbed over, and the mass of tangled rope brought down makes cutting a path round it a work of time which travellers never undertake.

While the great explorer's graphic description referred to the forests of what is known as "the Manyema Country" west of Lake Tanganyika it is an equally good picture of the forest extending eastward to Albert Nyanza. This great territory is practically all forest and a weird region of eternal twilight inhabited by the pygmies, monkeys, and other members of the great African managerie.

Con'go, French. See FRENCH CONGO.

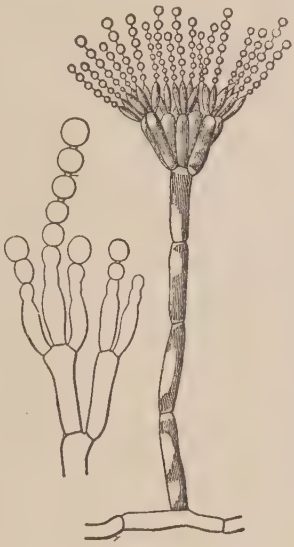
Con'go, The, is the great river of equatorial Africa and the second largest river in the world. Its mouth was discovered by Diego Cam in 1482, who set up there a pillar and called it the Pillar River. The Portuguese following him did not go far into the interior, and called it the Zaire, a native word meaning "the river." The country thereabout was called the Congo, and the map-makers gave the name to the river. Captain Tuckey, in 1816, wished to see if it was not a mouth of the Niger, and with his boats went up the first navigable part, 110 miles; but many of his men sickened and died, and for half a century the river was avoided by all but the hardy slave-traders. Livingstone, between 1867 and 1871, while exploring between Lakes Nyasa and Tanganyika, found a large river flowing to the north, which he thought to be the Nile. Five years later, Stanley, exploring in the same lake-region, gazed on the mighty stream, and, following its course to its mouth, proved it to be the Congo. Lake Bangweolo is the reservoir from which the Congo issues, called there the Luapula. Flowing north, it widens into Lake Moero; from here, as far as Nyangwe, its name is the Lualaba; from Nyangwe to Stanley Falls Stanley named it the Livingstone; and from Stanley Falls to its mouth it is known as the Congo. It is 3,000 miles long, and drains an area of 1,600,000 square miles. It discharges a body of water into the Atlantic second only in volume to the Amazon. Its two largest branches are the Kasai from the south and the Mobangi from the north. The Congo is divided into the lower, the middle and the upper river. The lower river is navigable for its entire length up to the rapids, a distance of 110 miles, for steamers of 18-foot draught; the middle river is unnavigable through the cataract region, extending 255 miles to Stanley Pool. The upper river, as far as Stanley Falls, is navigable for 1,068 miles to steamers of four-foot draught.

Cong'ress of the United States, the legislative or law-making body. There are two houses, the house of representatives and the senate. The senate is made up of two members from each state, chosen by direct vote. (See U. S. p. 1974) for six years. One third of the senate goes out of office every two years. The senators now (1912) number 96. The representatives are chosen directly by the people every two years, the number of members from each state depending upon its population. A new apportionment is made every ten years in accordance with the decennial census. On the basis of the census of 1910 there is one representative to every 211,430 inhabitants. The house at present has 435 members. The vice-president of the United States is president of the senate; the house chooses its own speaker. All money or appropriation bills must originate in the house. The senate has sole power of impeachment and of confirming or rejecting important appointments made by the president. Besides its legislative functions the senate is intrusted with the power of ratifying or rejecting all treaties made by the president with foreign powers, a two thirds majority of senators present being required for ratification. Congress lasts two years, and has two sessions, both commencing the first Monday in December. The first is called the long session, and lasts from seven to nine months, adjourning on a day agreed upon by the two houses; the second, called the short session, lasts until March 4, at 12 noon. Every bill which passes the two houses, is sent to the president for his approval or disapproval. In the latter case he vetoes it, that is, returns it with his reasons to the house where it originated; if it is passed again by a two-thirds majority in both houses, it becomes law. The powers of Congress are limited and separated from those of the state legislature by the federal constitution. By the 5th article of the constitution, Congress has the power to propose alterations in the constitution. The emoluments of a senator and representative in Congress, as fixed in 1907, are $7,500 a year, with traveling-expenses. The speaker receives $12,000. There also is an allowance each year to members for stationery and similar expenses. The representation of the various states in Congress in 1912 is as follows: Alabama 10; Arkansas 7; California 11; Colorado 4; Connecticut 5; Delaware 1; Florida 4; Georgia 12; Idaho 2; Illinois 27; Indiana 13; Iowa 11; Kansas 8; Kentucky 11; Louisiana 8; Maine 4; Maryland 6; Massachusetts 16; Michigan 13; Minnesota 10; Mississippi 8; Missouri 16; Montana 2; Nebraska 6; Nevada 1; New Hampshire 2; New Jersey 12; New York 43; North Carolina 10; North Dakota 3; Ohio 22; Oklahoma 8; Oregon 3; Pennsylvania 36; Rhode Island 3; South Carolina 7; South Dakota 3; Tennessee 10; Texas 18; Utah 2; Vermont 2; Virginia 10; Washington 5; West Virginia 6; Wisconsin 11; Wyoming 1; Arizona 1; New Mexico 1.

The first colonial congress met in New York, Oct. 7, 1765, made up of delegates from nine colonies. A second congress, which met at Philadelphia, July 5, 1774,

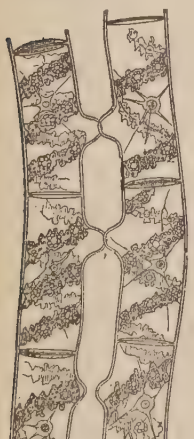
representing all the colonies but Georgia, set forth the well-known Declaration of Rights. This body became known as the Continental Congress, and on July 4, 1776, adopted the Declaration of Independence. The first congress of the United States met in New York in 1789 with 26 senators and 65 representatives. The next year it moved to Philadelphia, and in 1800 to Washington. See Woodrow Wilson's *Congressional Government;* Cooley's *Constitutional Limitations;* Von Holst's *Constitutional Law of the U. S.;* and Bryce's *American Commonwealth.*

Conid'ia (in plants), asexual spores of certain fungi, which are formed by cutting off a series of cells from special branches of the mycelium, resulting in more or less extensive chains of spores which separate easily. Such spores are well displayed by the mildews and the æcidium forms of rusts. They are often called conidiospores. The singular of the name is conidium.



CONIDIA

Co'nifers, the greatest group of living gymnosperms, containing such plants as the pines, spruces, hemlocks, firs, redwoods, cedars, cypresses, junipers, yews. The species are characteristic of the temperate regions of the northern and southern hemispheres, and are almost entirely absent from the tropics. Among them are some of the most valuable timber-trees, and the yearly inroads upon them for lumber, unless properly controlled, will result presently in their extinction. Their most characteristic features are the central shaft which never breaks up into branches the evergreen needle-leaves, the cones and the soft and very evenly-grained wood. They are a very ancient group, their remains occurring in great abundance in the earlier rocks. See GYMNOSPERMS.



CONJUGATION OF TWO FILAMENTS OF SPIROGYRA

Con'jugate Plants, a group of the green algae, in which different plants become united together by connecting tubes, through which fertilization is effected. The common pond-scum or *Spirogyra* is an example. See CHLOROPHYCEÆ.

Conjuga'tion. A process of fertilization occurring in certain of the lower plants (*Thallophytes*), in which the sexual cells (*gametes*) which unite to form the spore are alike in appearance, there being no distinction of male and female.

Conk'ling, Roscoe, American politician, was born at Albany, N. Y., Oct. 30, 1829; and died at New York, April 18, 1888. In 1846 he removed to Utica, N. Y., where he became district attorney, and was mayor in 1858. He was elected to Congress, and in 1879 to the Senate. In the practical business of both houses he took an active and prominent part, serving on important committees, and was instrumental in securing much useful legislation. He took an active part in the reconstruction of the southern states, and advocated resumption of specie-payments. He opposed President Johnson's policy and zealous championed Grant's administration; and in June 1880, nominated Grant for a third term. In 1881 he resigned his seat in the senate, owing to Garfield's exercise of control over appointments in his native state. In 1882 he was appointed associate-justice of the supreme court but declined. See his *Life and Letters.*

Connaught, Arthur, Duke of, Governor General of Canada (1911-1916), is the third son of the late Queen Victoria of England. Both in character and attainments, the duke was regarded as eminently qualified for the chief executive of the Dominion. Before his appointment he had served with distinction in the British army, traveled widely and availed himself of the opportunity to study the affairs of the empire at first hand. He was born in 1850. The duchess was Princess Louise of Prussia. The duke commanded the Guards brigade at Tel-el-Kebir and was mentioned three times in the dispatches.

Connecticut (*kŏn-nĕt'i-kut*) (name derived from Indian word meaning land on the long tidal river occupies the south western corner of the New England states. Its northern boundary is Massachusetts, 88 miles, its eastern, Rhode Island, 45 miles, western, New York, 72 miles. On the south 100 miles of irregular coast afford numerous good harbors, the best of which are New Haven and New London. The area of the state is 5,004 square miles. The census of 1900 gave a population of 908,420. A school census in 1907 showed a population of 1,037,614, and the latest census gives a population of 1,114,756.

The rivers are the Connecticut, navigable to Hartford, the Housatonic and the Thames, navigable through the tidewater. The various tributaries are the Farmington, the Naugatuck, the Shepaug, the Willimantic, the Quinnebaug and the Shetucket.

Ranges of hills cross from north to south, dividing the state into the eastern upland, the central lowland, the western upland and, south of these, the coast section. The rounded and fertile hills of the eastern upland have a lower average elevation than those of the western section, which in the extreme northwestern corner reach the height of 2,355 feet. The hills of the western upland are rugged and steep, broken by bold bluffs of trap-rock.

Nearness to the ocean renders the climate less severe than that of inland states of the same latitude. The weather is changeable. The mean annual temperature is 50°.

The geological formation of the state is interesting. Ridges of trap-rock are numerous through the central portion. These ridges, forced up through red sandstone, slope abruptly to the west and gently to the east. Copper and lead, both combined with silver, are found in Hartford County. Copper was formerly mined, the first copper cents used in America being made from Connecticut copper. Later the mines proved unprofitable and were abandoned. In the western part of the state a rich deposit of iron has been mined since 1730. Limestone, marble, brownstone (freestone), granite and slate are quarried. The timber includes hickory, oak, chestnut, butternut, beech, birch, maple, ash, elm. Much valuable forest-land remains, in spite of the large tracts which have been cleared. Scientific protection and increase of forests are encouraged by a state-forester and the Yale school of forestry.

Four causes combine to make Connecticut prominent as a manufacturing state: the favorable location geographically, ease of transportation by land and water, excellent water-power and the inventive genius of the people. Among the manufactured products are small hardware of all sorts, machinery, india-rubber goods, paper, silver-plated ware, hats, clocks and watches, thread, musical instruments, typewriters, sewing-machines, firearms and ammunition carriages, bicycles and motor-vehicles, cotton and woolen-fabrics and silk-fabrics. One large shipyard and two smaller ones do a considerable amount of shipbuilding. The New York, New Haven and Hartford Railroad, with its branches and trolley-lines, covers the state. Steamers run from New York to New Haven, New London, Bridgeport and Hartford.

Agriculture is second in importance among the industries. Of the crops raised, hay is the most valuable and has the largest acreage. The soil of the upper valley of the Connecticut is a deep, rich loam, especially suited to tobacco-raising. Much tobacco is raised here and in the Housatonic valley. The highlands are devoted largely to dairy-farming, the west and southwest to market-gardening. Orchard-fruits are an important crop. Fishing for bluefish is followed along the shore, where there are also valuable shell-fisheries. The Connecticut yields a fair catch of shad.

History. The first permanent settlements were made at Saybrook (1635), Hartford (1636) and New Haven (1637). Prominent men of this period were the Rev. Thomas Hooker and the Rev. Samuel Stone, who led about 100 men, women and children from Massachusetts to Hartford; John Winthrop, jr, afterward governor, who was commissioned by Lords Say and Brook to establish a fort at the mouth of the Connecticut, named Saybrook for its owners; and the Rev. John Davenport and Theophilus Eaton who founded the New Haven colony. The Indians of the Pequot, Narragansett and various smaller tribes were practically exterminated by the settlers in 1637.

Connecticut is known as the Constitution State from the fact that almost the first constitution adopted by vote of the people was drawn up and adopted by the Connecticut colony in 1639. In 1662 Gov. John Winthrop, jr, obtained a charter from King Charles II granting to the colony an unusual degree of independence. The hiding of the charter in an oak must be relegated to legend. It was, however, not surrendered at the demand of Sir Edmund Andros, royal governor of New England, but was withheld until 1689, when it was produced and the colonial government reestablished. The charter provided the accepted form of government until the adoption of the present constitution in 1818. Its terms and forms have been largely preserved in the constitution, and still are the organic law of the state. A convention held in 1902 to consider the revision of the constitution accomplished nothing. Representation under this constitution is institutional, the towns in existence in 1818 having two representatives each, the towns incorporated later having one or more representatives as the population is below or above 5,000. The system has proved efficient and has worked no injustice.

The state furnished 40,000 soldiers during the War of the Revolution. Jonathan Trumbull, then governor, was a valued friend and adviser of Washington. William A. Buckingham, governor at the outbreak of the Civil War, made the record of the state in that war remarkable for promptness and zeal. Nearly 55,000 volunteers went from Connecticut.

Immigration has changed the character of the population to a considerable extent in recent years. It is now 1,254,926.

Education. Supervision of the public-school system is in the hands of a board appointed by the legislature. Financial assistance of the towns is provided by a fund derived from the sale of Connecticut's share of land in the Western Reserve and by high-school grants, larger and more generally applicable than in any other state. The minimum school-year covers 36 weeks, the longest required by any state. Enforcement of child-labor laws is under the charge of the state board of education, and attendance laws are rigidly observed. Higher institutions of learning include Yale University, New Haven; Wesleyan University, Middletown; Trinity College, Hartford; Hartford Theological Seminary, Hartford; and Berkeley Divinity School, Middletown. The state maintains normal schools at New Britain, New Haven, Willimantic and Danbury. An agricultural college is maintained at Storrs by funds obtained in part from the U. S. government and in part from the state.

Connect'icut River, the largest in New England, is 450 miles long and is navigable to Hartford. It rises in New Hampshire, forms the boundary line between that state and Vermont, crosses Massachusetts and Connecticut, and enters Long Island Sound. Its many falls afford abundant water-power, and along its whole course it is noted for its beauty.

Connec'tive (in plants). That part of an anther which lies between the pollen-sacs. See FLOWER.

Con'nellsville, Pa., situated in the southwest of the state, about sixty miles southeast of Pittsburg, is the center of the United States coking-coal trade. It may be visited by branches of the Pennsylvania and Baltimore and Ohio railroads. In addition to the coking-coal industry, it has steel mills, coal-mines, brick-works and pump and machine-works. Population 15,000.

Conrad, Timothy Abbott, an American paleontologist, was born in New Jersey in 1803, and died at Trenton, N. J., Aug. 8, 1877. Early in life his attention was drawn to the geological features and crust-depressions in the western plains, while on surveying expeditions and while acting as paleontologist of the N. Y. geological survey. His published works include *Fossil Shells of the Tertiary Formations of North America, New Fresh-Water Shells of the United States* and *Paleontology of the State of New York.*

Conservation of Energy. The fact that energy is conserved or preserved without loss or gain, where to all appearance there are successive loss and gain of energy, is well-shown in the pendulum. By energy we mean capability to do work. When the pendulum is at the height of its swing, it may be said to be stationary. Though it seems then to have no energy, yet, owing to its elevation, it has *potential* energy, for it has the capacity to move with constant acceleration down to the bottom of its swing. There it is moving at its maximum rate, and has a maximum of kinetic energy or energy of motion, though it has lost the potential or static energy with which it started, which was due to its position and the attraction of the earth. This kinetic energy is enough to carry the pendulum up to a similar position on the other side. There again the kinetic energy has disappeared, for the pendulum is, as it were, still, but the same amount of potential energy is present as at first, for the pendulum is now ready to move as at first, though in the opposite direction. The pendulum, considered as a pendulum, now has potential energy equal in amount to the kinetic energy which it had before; for it has the power to move the same weight (*i.e.*, its own weight) through an equal distance, at the same average rate, as when it was moving at the bottom of its swing. So, at every point in the swing, the loss of potential energy is made up by an equal gain in kinetic energy, and *vice versa.* It is true that a pendulum will, after a time, stop swinging. But this is because forces outside it are acting upon it. There are the friction of the point on which it swings and the resistance of the air, etc. But the original energy of the pendulum is not lost. For, if we measure the energy of the heat which the friction and the resistance cause and the energy of the other motions of the air, etc. caused by the pendulum while it was swinging, we shall find that in that heat, motion, etc. there is just the same amount of energy, kinetic or potential, as that with which it started. The pendulum, its fulcrum or point of support, the air, the earth, etc. here form a conservative system. For any system of bodies, where the sum of the energy which its parts possess remains unchanged (through whatever changes, in position or motion, those parts may have passed) is a conservative system Every system of bodies that so far has been studied with respect to its energies has been found to be a conservative system. If we *assume* that the universe is fundamentally a system of material bodies and that it obeys, as a whole, the same laws of conservation that we observe in its parts, then the energy of the universe, of course, is always the same. That it always is the same is the *theory of the conservation of energy.* It is a theory, and not a fact of observation.

The *proof* of the conservation of energy depends upon our power to change one form of energy into another and to bring them all to one standard of measurement. The common standard of measurement for all energies is the erg, which is based upon

the force found necessary to produce upon a gram of matter a velocity of one centimeter a second. The form of energy to which all other energies can be reduced is that of heat. The proof, therefore, of the conservation of energy in any system depends upon the measurement of heat in terms of motion. That heat could so be measured was advanced as a theory by Count Rumford and Sir Humphrey Davy in 1798, and by Julius Robert Mayer in 1842; but it was first publicly demonstrated by James Prescott Joule in 1843. In 1845 he was able to state that the energy required to heat one gram of water at 1° C. is the same as that required to lift about 423 grams to a height of one meter. This result is very near that which is at present accepted.

According to the theory of matter which regards it as composed of very small particles moving and attracting one another, all potential energy is a kind of *strain*. There are strains of extension, of compression and of distortion, of electrification, of magnetization, of chemical separation and of gravitation. Perhaps all these may really be called strains of distortion. Kinetic energy may be of the following kinds, all of which are regarded as forms of motion: translation, rotation, vibration; and, as subclasses of these, heat, current-electricity, light, chemical activity, emanation (as in radio-activity) and probably other forms of motion. Now it seems that all these forms of energy, potential and kinetic, are transformable into heat; but heat is transformable into other kinds of energy only when there exists a difference of *temperature* between different parts of a system. Wherever, in any system, differences of temperature are in whole or in part removed, therefore, the energy of heat which that system contained is in whole or in part changed from being available into a condition of being unavailable for transformation into any other kind of energy. Now in any and all systems, in whatever processes they undergo, *there takes place this transformation of available into useless energy*. The useless energy is called the entropy of the system.

The theory of the conservation of energy is not understood until it is supplemented by this theory of the destruction or dissipation of *available* energy in all systems and throughout the universe. The grandest application of this theory open to us is undoubtedly the recognition of the sun and the earth, together with the surrounding ether, as a conservative system. Then the transformation of the heat of the sun into light, into the uplift of waters from the oceans, into the chemical energy of plants and of animals, into the resultant deposits of sediment and the erosion of mountain-ranges, into the heat of coal and the energy of Niagara, with all the applications of these forces to meet human necessities; the spectacle of all these countless changes and productions is dominated by the thought that of the energy thus poured forth none is lost, but abides in a potential or a kinetic form. And yet the *available* energy is continually diminished, as these changes, one and all, end their career in the form of heat, thereby continually diminishing the difference of temperature between the sun and that which surrounds it. Nevertheless we must remember that, admirable and consistent as these theories of conservation and entropy appear, they are subject to revision with the advance of knowledge and of mechanical art. PERCY HUGHES.

Con'stable, John, an English landscape-painter, was born in 1776 and died in 1837. He entered the Royal Academy when 23 years old, but his progress was slow. Not until 1814, 12 years after he had begun to exhibit pictures, did he succeed in selling one. But in 1819 his *View on the Stour* attracted much attention, and his reputation spread widely. His pictures are remarkable for the truth and vividness with which they reproduce country-scenes and the phases of nature. A French critic said that their leaves and grass are fresh with dew, and Fuseli jokingly asserted that they made him call for his umbrella. Among his best paintings are *Salisbury Cathedral*, *The Cornfield*, *The Lock* and *The Valley Farm*

Con'stance, Lake, lies 1,290 feet above the sea, between Switzerland and Germany, north of the Swiss Alps. It is forty-two miles long and seven and a half miles in average width, covering an area of 208 square miles; its greatest depth is 906 feet. The Rhine flows through it from east to west. The shores are formed by hilly lands; cornfields, vineyards, orchards and wooded hills, with here and there a ruined castle, surround the lake. The water is dark green, and in the spring often rises ten or twelve feet after a thaw. The fisheries are important.

Constantine I (*kŏn'stan-tīn'*), Roman emperor, called the Great, born 274 A. D., was the son of Constantius Chlorus. When 22 years old, he served as a soldier in Egypt and in Persia. In 305 Constantius and Galerius became emperors respectively of the west and the east. Constantine was now in the army of Galerius, who saw a possible rival in the young leader's brilliant genius and popularity among the soldiers, and so took every means to place him in danger. But Constantine hastily joined his father in the west, and on his death succeeded him in 306. However, things got into a muddled condition two years later, for six emperors were ruling at once, three in the east and three in the west. Constantine thus found himself opposed by two

rivals, Maximian and Maxentius, father and son. The father took refuge in Marseilles, and, when about to be given up by the people, killed himself. The son gathered a large army, but Constantine, quickly crossing the Alps by the Mt. Cenis pass, worsted him twice, and utterly crushed him in the battle of the Milvian Bridge in 312. It is asserted that Constantine, while on the march and near the Alps, saw a flaming cross in the sky, with the inscription: "By this, conquer." During the rout Maxentius was forced off the bridge and drowned. The night before the battle, it is said, Constantine saw a vision, in which he was told to place the monogram of the name of Christ on his soldiers' shields. In this way the standard of the cross came (after 323) to be borne by the Roman soldiers; and a year later, the eastern emperor, Licinius, joined with Constantine in granting Christians freedom of worship and the rights of Roman citizens. That Constantine became a Christian himself at this time is doubtful; but during his reign Christianity was made the state-religion, the heathen temples were closed, and toward the end of his life the great emperor was baptized. Linicius, now sole ruler in the east, was next conquered and put to death, and in 330 the western emperor, now sole master of the Roman world, made Byzantium his capital, changing its name to Constantinople, the city of Constantine. He died May 22, 337.

Constantine I. of Greece, who succeeded his father King George (*q. v.*), was forced by the Allies to abdicate in favor of his second son Alexander in 1917. He was born August 3, 1868, and was married in 1889 to Sophia, youngest sister of Emperor William of Germany. The action taken by the Allies was due to his alleged pro-German activities. On the death of Alexander in 1920 from the bite of a pet monkey, Constantine was recalled to the throne, but again abdicated in 1922.

Constantino'ple, capital of the Turkish empire, called Stamboul by the Turks, was formerly the ancient town of Byzantium and capital of the Byzantine or Eastern Empire. A colony from Megara settled it about 658 B. C., and its commanding position caused it to be fought for by Persians, Gauls, Greeks and Romans. In the fourth century Philip of Macedon lay siege to it, but was driven off by an Athenian army. The story is that the Macedonians' whereabouts was discovered by a crescent which shone out in the sky; so, ever since, a crescent has been the badge of the city. In 330 A. D. Constantine was so taken with its fine site that he made it his capital, giving it his own name, by which it is now known. Of the 26 sieges and eight captures it has suffered, that by the crusaders in 1204 was the worst, when all that was beautiful in the city, the church-treasures and even the bodies of the dead were plundered. In 1453 Constantinople fell before the conquering Turk and has never been besieged since, chiefly, in modern times, because of the renown of the Ottoman empire and, later still, because of the jealousy of the European powers, which would not allow any one of them to capture the prize of the Bosporus.

Stamboul or Constantinople proper stands on the site of old Byzantium, south of the Golden Horn, a creek five miles long, half a mile broad and deep enough to float near to the shore the Turkish ironclads. The 14 miles of walls first built by Constantine still encompass the city. Stamboul, like Rome, has its seven hills, where over 200 beautiful mosques and countless chapels rise from a mass of tumble-down, ill-smell-

ing wooden houses and long rows of picturesque bazars. There are many suburbs, including Eyyub, where is the mosque in which every sultan must gird on the sword of Osman before he ascends the throne. No Christian is allowed to approach the holy place. The trade of Constantinople is large and mostly in the hands of Europeans. There are 20 miles of fortifications along the Bosporus. Railroads now connect Constantinople with Paris and other European cities and also with towns in Asia Minor. Population, 1,200,000.

Constitution, The, or **Old Ironsides.** A famous American naval vessel. A 44-gun frigate of 1576 tons, she was launched Sept. 20, 1797. She took part in the operations against the pirates in the Mediter-

ranean in 1803—the recapture of the Philadelphia and the bombardment of Tripoli. In the war of 1812, she brought renown to the American Navy. Aug. 19, 1812, under Capt. Isaac Hull, she fought and destroyed the British ship Guerriere and Dec. 29, of the same year, under Capt. Bainbridge, she won a hard fought battle with the Java, which she destroyed. Under Capt. Stewart she captured four prizes in 1814, and Feb. 20, 1815, she captured, after a terrific fight, the Cyane and the Levant. In 1830 she was condemned to be broken up, but Oliver Wendell Holmes published his thrilling poem "Old Ironsides," which aroused public protest, and the grand old ship was saved. She was rebuilt and did further service, crossing the Atlantic for the last time in 1878. In 1897 she was retired to the Boston Navy Yard, where she did service as a barrack ship.

Consul, Mercantile, the name given to those officers a nation maintains in a foreign country for the protection of its trade and the rights of its merchants and to whom the further duty is assigned of keeping the home-government informed of all facts bearing on the commercial interests of the country. The practice of maintaining these consular agents had its origin among the trading cities of Italy in the 12th century. It has since gradually widened, and in the 16th century had become a regular custom throughout Europe. The consul's first duty on reaching his post is to show his commission to the authorities of the country and receive their sanction of his appointment. This sanction is called an *exequatur* —from the Latin word meaning to perform or execute. Consuls attend mostly to commercial affairs, such as examining and viséing a ship's papers, taking note of losses at sea, providing for disabled seamen, making regular reports on prices of crops; while in some half-civilized countries the consul is a judge. Treaties are made giving the consular court power to settle all disputes between citizens of his own country. This is usually the case in some North African and Asiatic states, where the lives and property of foreigners could not safely be left to depend on their poorly carried-out laws. In 1908 Congress passed a law for the reorganization of the American consular service, which had fallen far behind the commercial requirements of the times, and the law took effect on July 1.

Consumers' League. The consumers' leagues are organizations, chiefly of well-to-do women, to encourage proprietors of retail stores and of factories to treat their female and child employees well. The first league was formed in England in 1890, but the Consumers' League of the City of New York was organized next year. It was incorporated in 1898. Besides 63 leagues in 22 states, there are now *national* consumers' leagues in France, Germany and Switzerland as well as in America. The *National* Consumers' League deals with *factories*, and issues a label certifying that the goods have been manufactured in factories where the state's factory-law is obeyed, where ten hours are the maximum day's labor, where children under 16 are not employed, and where the inspection of the Consumer's League is welcomed. It also works for the passage of state and national laws to improve the condition of factory workers, especially of women and children. Its main office is located in New York City. The general secretary is inspector and missionary for the league. Its work has been heartily endorsed by the president of the United States.

The state and city leagues adopt the regulations of the National Consumers' League, regarding the manufacture of goods; and also aim to improve the condition of retail stores, by drawing up a list of "fair houses," where proper conditions prevail. Members of the leagues give these stores the preference. Stores where men only are employed are not taken under consideration.

Contin'ua'tion-Schools, in the proper sense of the term, have scarcely any place in systems of public instruction in the United States. But, on the one hand, the need of such schools in order to supplement the education gotten in day schools either by liberal or vocational training is being more and more urgently felt; and, on the other hand, a beginning has been made by the Young Men's Christian Associations and by private enterprise. The evening-schools which are being conducted in connection with many city-school systems are at present little more than schools for the illiterate; but genuine continuation-courses are already being offered in them to a small extent in New York City and elsewhere. Such continuation-work as is to be had is patronized chiefly by apprentices, assistants in business houses and offices and machine-operators. There is need of more advanced training for journeymen and skilled workers. It is clear that vocational training is felt to be the essential function of the continuation-school. The older method of apprenticeship has well-nigh disappeared, and only the continuation-school can take its place and improve upon it.

Probably Massachusetts has done more than the other states in the direction of providing continuation-schools which are more than mere evening-schools for illiterates. Most important is the success of her three state textile-schools at Lowell, New Bedford and Fall River. While there are comparatively few day students, for obvious reasons, the night attendance (by mill operatives) is very large.

During a little over ten years attempts have been successfully made by the Young Men's Christian Association to found continuation-schools. There now are 400 of these schools in the U. S. under local or state supervision. Several business and manufacturing firms, such as the Boston Elevated Railway Company, the New England Telephone and Telegraph Company and the Edison Company, have contributed largely to the support of the continuation-schools conducted by the Y. M. C. A. Rather more doubtful is the value of the correspondence-schools which are for many workers the sole vehicles of continuation-work. These schools are often efficiently conducted; but their method is apt to be discouraging and their management mercenary.

In Germany continuation-schools developed from the attempt made by the Sunday-schools in 1760 to extend their teaching to primary secular subjects. An impetus was given to the movement by the foundation of free schools for the workers, first by Berlin and later by other cities. The modern German *Fortbildungschulen* or continuation-schools, numbering 3,000 in Prussia and four times that number in the empire, are one secret of the industrial advances of modern Germany. France has several kinds of continuation-schools, especially commercial schools and polytechnics. The English continuation-schools are largely of an advanced and secondary character. There are systems of continuation-schools also in Italy, Switzerland, Holland, Sweden and Australia; designed to meet the same problem of providing liberal and vocational training for those whose days are filled with toil. See CORRESPONDENCE-SCHOOLS.

Convolvulus, Wild Morning-Glory, a common white or pink-and-white wild-flower of wayside wall and bank. It is much like the cultivated morning-glory of the home-garden, but is a hardier plant; the flowers are less frail and remain open longer, and it is perennial. It is also called Hedge-Bindweed, also Lady's Night-cap. It grows as far south as North Carolina and west to Nebraska, and blooms from June to August. It is a rapid grower and a great twiner, the Latin name *Convolvulus*, meaning little twiner. On moonlight nights the flower remains open, giving welcome to visiting moths. To the *Convolvulus* family belongs the sweet-potato vine; and also a member of this family is that bane of the farmer, dodder, small or field bindweed.

Cook Islands. Capt. Cook in 1773 discovered a number of islands between 8° and 23° south latitude and 157° and 170° west longitude. These number six principal and a number of smaller islands, which with several others were attached to New Zealand for administrative purposes in June, 1901. Rarotonga, the chief island, is 20 miles in circumference and has 2,060 inhabitants. The total population is 6,324.

Cook, Frederick Albert, American physician and explorer, was born at Calicoon Depot, Sullivan Co., New York, June 10 1865. He was graduated from the University of New York in 1890, and received his medical degree from the same institution. He was surgeon of the Peary Arctic expedition, in 1891–2, and surgeon of the Belgium Antarctic expedition 1897–9 In 1903-6 he explored the mountain regions of Alaska and claimed to have ascended Mt. McKinley. He is the author of *Through the First Antarctic Night* and *To the Top of the Continent*. In July, 1907, he sailed north in a fishing schooner, reaching Smith Sound where he wintered. On Feb. 19, 1908, he started with a sledge train for the pole. In Sept., 1909, he returned to civilization and announced that on Apr. 21, 1908, he had reached the north pole, where he spent two days in taking observations. His proofs, submitted to scientists of Copenhagen University, did not stand the test of examination and his claim was discredited. See *Polar Explorations*.

Cook, James, Captain, a great English navigator, was born Oct. 28, 1728, the son of a farm-laborer. In 1755 he entered the royal navy and became a master-mariner, and at this time surveyed the shores of Newfoundland and the St. Lawrence. In 1768, as lieutenant in command of a ship, he sailed to Tahiti with an expedition to observe the transit of Venus. On the return voyage he sailed around New Zealand for the first time, mapped its coasts and explored the east side of Australia.

His second voyage was spent exploring the lands of the Antarctic on the edge of the sea of ice.

His third voyage was made as captain in charge of two ships. After discovering Hawaii, which he named the Sandwich Islands, he followed the North American coast, trying to find a northwest passage from the Pacific to the Atlantic. He reached Bering Strait, but, forced to turn back, he made Hawaii in 1779. Here he was murdered by the islanders Feb. 14, 1779. Captain Cook, perhaps more than anyone else, added to our knowledge of the Pacific and Antarctic Oceans. His surveys also have stood later tests and been found accurate.

Cooley, Thomas McIntyre, American jurist, was born at Attica, N. Y., Jan. 6, 1824; and died at Ann Arbor, Mich., Sept. 12, 1898. He studied law and in 1846 was admitted to the bar; in 1859 be became professor of law in the University of Michigan; and, with an interval of some years when he was chief-justice of the supreme

court of his state, he returned to his university professorship as dean of the school of political science and lecturer on constitutional and administrative law. Between 1887 and 1891 he served as chairman of the interstate commerce commission. He was an able and industrious writer of legal text-books, which have become standard authorities; the chief of these are *The Constitutional Limitations which Rest upon the Legislative Power of the States of the American Union; The Law of Taxation; Wrongs and Their Remedies;* and *The General Principles of Constitutional Law in the United States.*

Coolidge, Calvin C., elected vice-president of the United States November 2, 1920, was born in Plymouth, Vermont, July 4, 1872. Securing employment as a farm boy, he attended grammar school and later was a student at Amherst, Tufts and Williams colleges. He adopted the legal profession and practiced in Northampton, Mass., later serving successively as alderman, mayor, and city solicitor. He was elected first to the Massachusetts house and afterward to the senate. In 1916 he was chosen lieutenant-governor, became governor two years later and in 1919 was re-elected and held office until chosen for the vice-presidency.

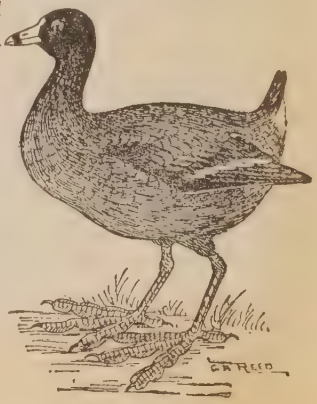
Cooper, Sir Astley, a distinguished surgeon and writer on surgery, born at Norfolk, England, August 23, 1768. Was first to attempt tying the carotid artery and the aorta, though he was not successful in either. Besides his fame as a surgeon and as a writer on surgery, he was very successful as a teacher. He also made surgery, which before his time had been largely guesswork, a science.

Cooper, James Fenimore, American novelist, was born at Burlington, N. J., Sept. 15, 1789. After three years at Yale he entered the navy, rising to the rank of lieutenant. His first novel was a failure; but in 1821 *The Spy* made him popular. Following this came *The Pioneers,* the first of the famous *Leather-Stocking Tales.* In 1823 appeared *The Pilot,* the earliest of his sea-tales. Throughout his life he was a busy writer, now correcting the false impressions of his country which he found current in Europe, now writing a novel to give expression to his views of politics, now ridiculing his countrymen's faults and anon bringing out sketches of travel. But his fame rests on his early novels, the best of which have been translated into most of the languages of Europe and into some of those of the east. He, practically, was the first American in American literature. He died Sept. 14, 1851.

JAMES F. COOPER

Cooper, Peter, was born at New York, Feb. 12, 1791. His father, who had been a lieutenant in the Revolutionary War and was a hat-manufacturer, was not successful in business, and had a large family to provide for. So Peter's boyhood was one of hard labor. He went to school half of each day for a single year. When 17, he was apprenticed to a coachmaker, and pleased his employer so much that he offered to set him up in business, which he declined. After trying different branches of trade, he began the manufacture of glue and isinglass, which he carried on for 50 years. Seeing what profits could be made in iron, he built several mills. In 1845 he erected at Trenton, N. J., the largest rolling-mill at that time in the country for the manufacture of railroad-iron. He first succeeded in using anthracite coal in puddling iron; was the first to roll wrought-iron beams for buildings; and also designed and built the first locomotive made in America, which was used on the Baltimore & Ohio Railroad. In his own youth Cooper had greatly felt the lack of means of study in the line of his trade, and he determined that other artisans should have a better chance. So Cooper Union, to which Mr. Cooper gave $800,000 in all, was built. It covers a whole block in the center of New York city. Here young mechanics and others receive night-lessons in engineering, mining, metallurgy, chemistry, architectural drawing and building. There also are schools of design, telegraphy, wood engraving, photography, etc. The Union is free to all who choose to attend. Besides the school proper there are free lectures, a free library and reading-room, art-galleries, models of inventions and

PETER COOPER



AMERICAN COOT

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PRESIDENT CALVIN C. COOLIDGE

CALVIN C. COOLIDGE, the sixth Vice-President to be elevated to the high position of President of the United States through the death of the President, took his oath of office in a little Vermont farmhouse early in the morning of August third, 1923.

He was born in the small town of Plymouth, Vermont, July fourth, 1872. There, living the early years of his life, he differed but little from the average American boy. From early youth he has been quiet, unassuming and serious minded. After years spent in the Plymouth school district and on the farm, he attended the Black River academy at Ludlow, Vermont, twelve miles from Plymouth. This school was like many similar schools which one may find in hundreds of American towns. It had every possible facility for developing character. From the Black River academy he went to the academy of St. Johnsbury, the first long step away from his home at Plymouth. From St. Johnsbury he proceeded to Amherst College in Massachusetts where he graduated with honors and an A.B. degree in 1895. He immediately afterwards took up the study of law in the office of a leading lawyer of Northampton, Mass., and was admitted to practice in less than two years later.

Presently, he was elected to the Northampton City Council. His popularity increased and he steadily advanced thru the various city and state offices in Massachusetts until finally in 1919 he was elected governor.

During the campaign for his re-election in the fall of 1919 a crisis occurred in Boston. Despite every proper effort to prevent such a catastrophe, the majority of Boston police left their posts. Anarchy, disorder and terror gripped the city. Boston suddenly presented an acute test of the authority of the law and the invincibility of government. Governor Coolidge seized this situation with a firm hand. Under his guidance order was restored, state troops were placed in command of the situation and a new police force was organized. His promptness of decision and firmness in handling a difficult situation focussed the attention of the American nation upon him.

At the 1920 Republican Convention in Chicago he was nominated for Vice-President by an overwhelming majority on the first ballot. He has been little in the public eye since his election to the Vice-Presidency, but as president of the Senate he conducted the sessions efficiently and as quietly as possible, saying little, but observing much. He became the thirtieth President of the United States upon the sudden death of President Warren G. Harding in San Francisco, California, Thursday, August second, 1923.

Calvin Coolidge is a representative American in every way. He rose from a humble beginning to the highest honor in the Nation by making the utmost use of every capacity he has had, by applying his best talents and by keeping his judgment cold and his love for humanity warm.

other facilities and equipments. Cooper died April 4, 1883.

Coot, a water-bird, also called mudhen and crow-duck. It differs from the rail in having lobed toes, which assist in swimming. It is about 14 inches long, with a short tail, with a slaty-black plumage and some white marks near the tail. The bill is pointed and ivory-white, distinguishing it from the duck. It breeds in bogs, and frequents quiet pools and rivers, but prefers the neighborhood of small muddy ponds. The food is water-insects, small fish, worms, seeds, grass, etc. It lays from eight to 12 eggs, yellow-buff in color and marked with fine dots and spots of brown and very faint lilac lines.

Cope, Edward Drinker (1840-97), one of the most distinguished of American naturalists. He was of Quaker descent and was widely known in the field of comparative anatomy. For many years he was editor of the *American Naturalist* and professor in the University of Pennsylvania. He made extensive collections of the fossil vertebrates from the rocks of the western states, and filled his house in Philadelphia to overflowing with them. He prepared several monographs for the United States government. He was a voluminous writer, but most of his writings were technical. As examples of his many publications we mention only *Origin of the Fittest* and *Tertiary Vertebrates of North America* (1889). He died at Philadelphia on April 12, 1897.

E. D. COPE

Co'penha'gen, the capital of Denmark, is on the island of Zealand, with outlying parts on the island of Amager and the mainland. The city is defended by fortifications recently built and by old forts, especially by the citadel of Frederikshavn. The square, *Kongens Nytory*, is the center of the town's life. Its cathedral has a baptismal font by Thorwaldsen, and the Thorwaldsen museum has many of that sculptor's works. The royal castle, called Christiansborg, has a fine art-gallery, some of the pictures in which were burned in 1884. The university, founded in 1479, has 85 professors, 400 students and a library of 250,000 volumes; while the royal library has over 500,000 volumes. Copenhagen in the middle of the 12th century was a mere fishing-village. It was made the capital in 1443. The town has had three fires, and has been besieged and bombarded many times. It was in its fine harbor that Nelson, in 1801, destroyed the Danish fleet. The annual trade of the port amounts to about $120,000,000. Its industries embrace ship-building, distilling and brewing, sugar-refining, the manufacture of porcelain, soda, machinery and textile fabrics. Population, 462,161; or with its suburbs, 559,398.

Copernicus (*kō-pĕr'-nĭ-kŭs*), **Nicolaus,** the founder of modern astronomy, born at Thorn in Prussia, Feb. 19, 1473; died at Frauenburg, May 24, 1543. Previous to the time of Copernicus—or, roughly speaking, previous to the discovery of America—there existed among scholars a great variety of views regarding the structure of the solar system and regarding its relation to the fixed stars. The chief merit of Copernicus is that he first solved in a fairly satisfactory manner the great problem of the motion of the planets. If not the first to propose, he certainly was the first to work out, in detail, an explanation which is so simple as to command acceptance from everyone who clearly understands it. Instead of assuming, as the Egyptians and the Greeks and most people after them had done, that the earth is the center of the solar system, Copernicus assumed that the sun is the center, that the earth and the other planets revolve about the sun in circular orbits and that the earth rotates on its own axis. There are a number of details which Copernicus was unable to explain because he did not know that the orbits of the planets are elliptical, as was proved later by Kepler. Copernicus was educated at the University of Cracow, whither he went in 1491. Later he spent some years of study at Bologna and Padua, and at the latter place he took the degree of doctor of medicine in 1499. In 1503 he went to Frauenburg, where he practiced medicine and held several important offices in the church. The years from 1507 to 1530 were spent in the preparation of his immortal book: *The Revolutions of the Heavenly Bodies*, which, however, was not printed until after his death in 1543. The defense of the Copernican system was, therefore, left largely to his successors, principally among them to Giordano Bruno of Italy and to Galileo. The position of Copernicus in history may be more easily retained in memory, if the student will recall that he and Michael Angelo were contemporaries, there being only two years' difference in their ages. On the day that Michael Angelo died, Feb. 18, 1564, Galileo, the great defender of Copernicus, was born; while in the year that Galileo died, 1642, the illustrious Newton, who was to perfect and simplify the Copernican system, was born in England.

Copley (*kŏp'lĭ*), **John Singleton,** an American painter, was born at Boston, Mass., July 3, 1737. When only 16, his portraits were admired. Washington sat to him in

1755, and later, in London, he painted the king and queen (George III and his consort). Here, also, he became the friend of such men as West and Reynolds. Some of his best works are *Death of Lord Chatham, Death of Major Pierson, Charles I Demanding the Surrender of the Five Members* and the *Assassination of Buckingham.* His historical paintings are perhaps superior to those of West, and his portraits rank with those of Reynolds and Gainsborough. He died at London, Sept. 9, 1815.

Cop'per. This appears to have been the first metal used by man, both in war and in the peaceful arts. Like gold and silver, it is found native, sometimes in great masses, as on the south shore of Lake Superior, where blocks of many tons' weight have been obtained. The use of copper by ancient nations is well-known, through the many collections in museums of weapons and other objects of bronze, that is, copper mixed with a small quantity of tin. The ancients obtained most of their copper from Cyprus; hence the name. Copper has a fine red color, takes a brilliant polish, and is nine times heavier than water. Next to silver it is the best conductor of heat and electricity. It is moderately hard and highly tenacious, though not so strong as iron. The largest masses of native copper are found in the mines of Russia and in our own Lake Superior region. Copper is used in many ways. With other metals it makes brass, bronze and gun-metal; alone, it is used for boilers, cooking-vessels, pipes, wire, nails, spikes; in thin plates it is used for engraving and etching, and in strong rollers for calico-printing; as an electro-deposit it is used in copying engravings and pages of type for the printing-press. Copper is usually employed for lightning-conductors. Yellow metal, an alloy of copper, is used in sheathing the bottom of vessels. The United States is now the largest producer of copper. The richest mine in the world is at Calumet, Michigan, on Lake Superior. Arizona, Montana, Utah and other parts of the Union also produce copper. The world's production of copper, in 1906, was 715,268 tons, the chief countries producing the metal, besides the United States, being Chile, Japan, Mexico, Australasia, Spain, Portugal, Germany and South Africa.

Copperfield, David, published in 1850, is perhaps the greatest of the works that have come from the pen of Charles Dickens. This book gives a picture, on the one hand, of a charming candor and honesty and, on the other hand, of the misery and desolation that may be wrought by evil. In many ways *David Copperfield* is an account of the experience of Dickens himself, at least as regards his childhood and youth. The hardships, the loneliness, the uninviting tasks and even the debtor's prison were his own. John Dickens and Mrs. Dickens seem to have furnished him with models for the Micawbers; and their house in Gower Street, London, was too often the scene of real sieges by angry "duns." But the book itself has all the interest of a great novel. Readers of *David Copperfield* never utterly forget the impression of the happy home at Norfolk, the second marriage of David's mother and the difference which it makes for the child, the steady toil in the London warehouse, the loves of David with Dora and Agnes and the darker pictures of the betrayal of Emily and the villainy of Uriah Heep, whose schemes are in the end defeated by Micawber.

Copperhead. (*Ancistrodon Contortrix*) This venomous snake belongs to the rattlesnake family, but it has no rattle and gives no warning of its attack. Its head is the color of burnished copper, its body is brown or sometimes golden, with dark blotches, Y-shaped on the sides and round on the belly. It grows to over four feet in length, and is as venomous as any of our snakes. But the stories told of its ferocity in attack are probably untrue. It is sluggish, and the chief danger is lest, in picking up some object on the ground or in putting one's hand in the brush, one should touch it. In winter it sleeps in a ground-hole or den; from spring to autumn it seeks damp places, especially among rocky hills. In midsummer the young are born, alive. Its favorite food is field-mice. It is common among the hills that border the Hudson and Connecticut valleys; but it is also found from Massachusetts to Texas, though frequently called by such names as pilot, red-eye, red adder and copper-belly.

Copts, the Christian descendants of the old Egyptians. There were 609,511 of them in 1897, forming one twelfth of the population of Egypt. Most of them live in Cairo, but there are a number in Upper Egypt. They make good clerks and handicraftsmen. They are of middle height, with black eyes and curly hair. They dress like the Mohammedans; but can be told by their black or blue turbans. They are, as a rule, a morose people, but are the best educated and most intelligent of the native Egyptians. St. Mark is said to have made them Christians. The head of the church is the patriarch of Alexandria; they have bishops, monks and priests, the priests being allowed to marry before they take their vows; the patriarch does not marry, and when he sleeps he must be awakened every quarter of an hour. Wednesday and Friday are fast days, and the fast of Nineveh lasts nearly two months. The Coptic language goes back to the old Egyptian; the boys learn to read it at school, but Arabic is everywhere spoken. The United Presbyterians from the United

States have for 50 years had wonderful success with them.

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International copyright was secured in the United States by a bill in Congress, passed in March, 1891, which took effect in the following July. This act is known as the Chase bill. It gives foreign authors a copyright in the United States of America when the book or production is from type set, or from negatives or drawings on stone made, within the United States. Musical compositions are exempted from the second condition. The act, however, applies to the work or production of a citizen or subject of a foreign state or nation only when such foreign state or nation permits to citizens of the United States of America the benefit of copyright on substantially the same basis as its own citizens, or when such foreign state or nation is party to an international agreement which provides for reciprocity in the granting of copyright, by the terms of which the United States of America may, at its pleasure, become a party to such an agreement. The United States has entered into agreements of reciprocal copyright with Belgium, Denmark, France, Germany, Great Britain and her possessions, Italy, Portugal Spain and Switzerland. An American may secure copyright in Belgium by registering his work at the Department of Agriculture, Industry and Public Works in Brussels. In France it is given upon the deposit of two copies of the work with the Minister of the Interior at Paris; in Switzerland, by the registration of the work at Berne in the Department of Commerce and Industry, with a copy to be there deposited, accompanied by a fee of two francs.

Coquelin (*kŏk-lăn'*), **Benoit Constant,** a noted French comedian and, with his brother, also an actor, a writer on stage-art, was born in 1841 at Boulogne, and educated at the Paris Conservatoire. He first appeared at the Théâtre Français in 1860, and has met with great success in France, England and the United States in the representation of classic French comedy. His chief successes have been wor in *Le Marriage de Figaro*; *La Malade Imagi*

M. COQUELIN

naire; Fourberies de Scapin; Le Lion Amoureux; and *Cyrano de Bergerac*. He died Jan. 27, 1909. His son, Jean (Coquelin *fils*), born in 1865; made his first appearance on the stage in 1890, and has, with great acceptance, filled many of his father's famous rôles.

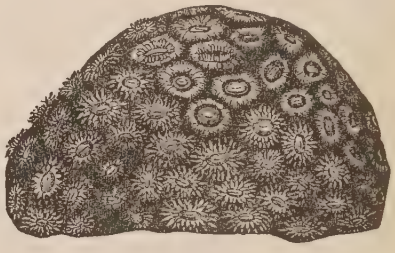
Coral, the skeleton of sea-animals called polyps, constructed like the sea-anemone. The coral is formed within the fleshy part of the animals, without effort on their part, as bones grow in the body. Each polyp consists of a tubular body, fixed at one end. The other end is surmounted by a disc, in the center of which is a mouth, and the disc is surrounded by tentacles. The coral substance is carbonate of lime, and is laid down within the walls of the tubular body, and within membranous partitions reaching from the body-wall to the stomach-wall.

CORAL

It is formed in the lower part of the animal, leaving the upper part soft and flexible, and capable of being drawn in and expanded.

The coral-producing animals are sometimes solitary, but, more frequently, occur as colonies of many individuals, united together by a common branching stalk, so that the whole colony is shrub-like. Their general resemblance to plants is so great, that at one time they were called plant-animals. At intervals, along the trunk and branches of the shrub-like colony, are found the individual polyps. These are all connected by an expanse of living matter. The polyps take food from the water into the mouth-cavity, which leads at once into the tubular stomach, and the arrangement is such that the tubular canals of different individuals communicate, making it possible for the food to be carried from one part to another throughout the colony. Coral that is formed within a colony of this description is of the branching kind. (See illustration.) The limy substance is not only laid down in parts of the polyps, but in the expanse of living matter joining them together, and, therefore, the formation is continuous and assumes the general form of the colony. In the illustration the position of the polyps can be seen as small tubular elevations. There is great variety as to the size of different kinds of polyps. The illustration shows the common branching coral (*Madrepora*) of the Florida coast, in which the polyps are small. The colonies are not always of the branching form; some are in the shape of large rounded masses, with the polyps arranged in rows or furrows, as in the brain-coral and the star-coral. (See illustration.) These masses grow to be from one to three feet in diameter.

Besides living corals there are many fossil forms. Among the commonest are those stony masses, often called petrified honeycomb and petrified wasp's nests, to be found on beaches, in fields and imbedded in rocks. The honeycomb-shaped



CORAL

masses, especially, are polished and known locally as Mackinac stones. They are used as paper-weights and, to some extent, in jewelry. There also are chain-corals and the single horn-shaped corals.

Red coral is of a different kind. Although the colony which forms it is tree-like and the individual polyps have long tubular bodies, the coral substance is laid down in the base of the polyps—not in their body-walls—and, also, in the sheet-like expanse of living material that unites them. As a consequence, the product is smooth and not marked by elevations. The ordinary red coral used in necklaces and scarf-pins is not expensive, costing from one to one and a half dollars an ounce; but large pieces of the approved rose-tint, which are rare, bring several hundred dollars an ounce. In addition to the kinds mentioned, there are others, known as sea-fans, sea-plumes, etc. The stalk secreted is horny or limy, and, in the sea-fans, is a broad, thin expanse of reddish or yellowish material, formed into a fine network, with thickened veins running through it like the veins in a leaf. These are related to the red corals. The corals are one branch of a subkingdom of animals (*Cœlenterata*) that embraces jellyfish, hydroids and fresh-water hydra.

The extent of coral-formations in tropical seas is remarkable. These animals thrive only in warm (68° Fahr. and above), clear

water, and not below a hundred and twenty feet in depth. From that depth to the surface they live readily and form reefs. The great barrier reef (coral) of the northeastern coast of Australia stretches, with some interruptions, a thousand miles along the coast, and is in places from one to three miles wide and from twenty to sixty miles from the mainland. Some islands are entirely composed of coral-formations, and the everglades of Florida and the keys south of it are mainly coral-formations. There also are *atolls* or circular coral-reefs in mid-ocean, and, although their method of formation is now under dispute, the old explanation meets the requirement in some cases. It is supposed that they were originally built upon the sloping sides of a volcanic island and that, by very gradual sinking, the island disappeared below the water, leaving a central lagoon. The coral-animals, in the meantime, built toward the surface and kept pace with the subsidence. See Dana: *Corals and Coral Islands;* Darwin: *Structure of Coral Reefs;* Verrill in *American Naturalist,* Vol. II., p. 351.

Corday, Charlotte. See MARAT.

Cor'dova or **Cor'doba,** a city in Spain, on Guadalquivir River. Its old walls are surmounted by turrets, shut-in gardens, vineyards and narrow streets. Its cathedral was built as a Moorish mosque in the 8th century, and is the finest Mohammedan temple in Europe. Cordova was founded by the Romans in 132 B. C.; was captured by the Goths, and then by the Moors. From the 9th to the end of the 12th century it was one of the leading Moorish cities, famed for its mosque, palaces and great university. Cordova is also a province of Spain, with an area of 5,299 square miles and a population of 455,859. Its chief product is coal. Population of the town, (1900) 58,275.

Coréa. See KORÉA.

Corelli, Marie, a notable and prolific English novelist, the adopted daughter of the Scottish song-writer, the late Charles Mackay, was born of Italian parents and educated partly in England and partly in a convent in France. She was designed at first for a musical career; but early in the eighties she abandoned this for literature, making a marked success as a writer of fiction. It is said that a curious psychical experience, occurring to herself personally, suggested the theme of her first novel, which appeared in 1886,—*A Romance of Two Worlds.* This work, together with her novels, *Barabbas* and *The Mighty Atom,* met with a phenomenal sale, and all have been translated into most of the languages of Europe, as well as into Persian and Hindustani. Hardly less successful have been her other stories: *The Sorrows of Satan; The Soul of Lilith; Thelma; Wormwood; Ardath; The Murder of Delicia; The Master Christian;* and *Temporal Power*

Corfu (*kŏr-fōō'*), the largest of the Ionian Islands, the possession of Greece, lies at the entrance of the Adriatic Sea. It is 40 miles long and two and a half wide. The island is mountainous, the highest point being Pantocrator, 2,997 feet above the sea. The main export is olive-oil. Corfu was first named Corcyra, and was a colony of Corinth. It became so powerful that it fought with the mother-country the first sea-battle of which we know, in 665 B. C. Area 431 square miles; population (1896), 124,578. Population of the town of Corfu, 17,918.

Cor'inth, called the Star of Greece, lies on the Isthmus of Corinth, under the northern slope of the mountain, forming one of the strongest fortifications in the world, on which stood its citadel. With Argolis, Corinth forms a portion of the kingdom of Hellas, adjoining the isthmus that connects the Peloponnesus with Attica and the mainland. Its area is 1,442 square miles and the population of the province is about 170,000. The city has three harbors, and its position midway between the Ægean and Adriatic Seas made it a trade center. It was much easier to carry goods across the narrow isthmus than to sail around the Peloponnesus, and so in its western harbor lay ships from Italy, Sicily and Spain, while its two eastern harbors trafficked in the merchandise of Egypt, Syria, Phrygia and even India. Corinth itself exported chiefly statues, pictures, vases and bronze and earthenware vessels. Corinth built the first triremes or galleys, which, rowed by its numberless slaves, sailed everywhere, founding a dozen or more great colonies of the mother-country, the largest being Syracuse. We are told that Corinth was founded in 1350 B. C. by Sisyphus, an Æolian. Later, it was conquered by the Dorians. Sometimes it was under a king; at others under an oligarchy or the rule of the few. Its foremost king was Periander, who fostered the city's growth; the greatest patriot was Timoleon, whose love of his native city made him overthrow and slay his own brother, the tyrant, Timophanes, who had made himself master of Corinth. Corinth was the first city to become jealous of the rising power of Athens after the Persian War, and incited the other states to begin the great Peloponnesian War. Later, it waged the Corinthian War with Athens, Thebes and Argos against Sparta. Here Alexander was named the leader of the Greeks against Persia. In 146 B. C. the Romans razed Corinth to the ground. Just a hundred years later Julius Cæsar rebuilt it, and it soon became again a great trading-center. St. Paul lived here a year and a half, founded a Christian church and afterward wrote to the Corinthians two of his letters. Here also were held the famous

Isthmian games. The gods of the sea and of love especially were worshiped; it was the most vicious city of Greece, noted for its luxury and art. Later, Corinth was overrun by Alaric, the Slavs, Franks, Turks, Venetians and Turks again. When freed from the sultan in 1822, it had a steady growth until 1858, when it was devastated by an earthquake. It has since been rebuilt, three miles northeast of the old site and near the western mouth of the canal that has been cut through the isthmus. The population of Corinth at the height of its fame was about 300,000; population of the commune (Gortho) to-day is about 12,000.

Corinth, a town in Alcorn County, Miss. It is a railroad-junction, and so was of great importance during the Civil War. On Oct. 3, 1862, it was held by a Union force of 53,000 under General Rosecrans, and firmly intrenched. The Confederates, 40,000 strong, under Generals Price and Van Dorn, tried to carry the works by storm, but were repulsed and pursued with heavy loss. The Federal loss was 2,502; that of the Confederates, 3,117. The population of Corinth according to the last census, is 5,020.

Corinth, Gulf of. See LEPANTO.

Coriolanus (*kō-rĭ-ō-lā'nŭs*), **Gaius Marcius,** so called from his bravery at the taking of Corioli, a Volscian town, in 493 B. C. He was a Roman patrician, and so opposed the plebeians or common people. The people refused to choose him consul, and in return he made a speech in the senate against a free distribution of wheat to the citizens, which had just come from Sicily. Thereupon he was banished; but soon, at the head of the powerful Volscians, he won victory after victory, and now swooped down upon Rome. In vain did the leading men go to his camp to dissuade him from attacking the city. At last the noblest women of Rome, headed by Coriolanus's aged mother and his wife leading his two sons, came to his tent. His wish for vengeance could not withstand their tears, and he led the Volscians back to their own country. Shakespeare founded his *Coriolanus* on this story, as related in North's *Plutarch.*

Cork, a tissue usually formed in the outer part of the cortex of perennial plants. The tissue is characterized by the fact that the cells are flat, with no spaces between them, and the walls are water-proof. Cork is the most prominent part of bark, and the commercial supply is obtained from the bark of a species of oak, *Quercus Ilex* (often called *Q. suber*). Forests of cork-oak are cultivated in southwestern Europe.

Cork (meaning swamp), a city of Ireland, is situated on the River Lee, in a pretty valley, built partly on a group of little islands, joined by nine bridges to the rest of the town, which is built on the river-banks. Its race-course park and Mardyke, a shaded walk a mile long, are its chief features. The cathedral, St. Ann de Shandon's church and Queen's College, founded in 1849, are the main buildings. The city owes its growth to the facilities afforded by Cork harbor, a basin ten miles square. It is guarded by batteries, with three forts fitted with the heaviest guns. On the banks of the Lee are also four miles of wharves. Cork is a busy manufacturing and exporting city. Its port is Queenstown. In 600 an abbey was erected on its site, and the Danes built its walls in the 9th century. It was surrendered by its last king Dermod MacCarthy, to Henry II in 1172. Cork also is a county in the province of Munster, area 2,890 square miles. Population, 391,090. Population (1911) of the city, 76,632.

Corm, a special form of thickened underground stem which resembles a bulb in outline, but has thin scale-leaves upon it, instead of fleshy ones. Indian turnip (from Jack-in-the-pulpit) is a typical corm.

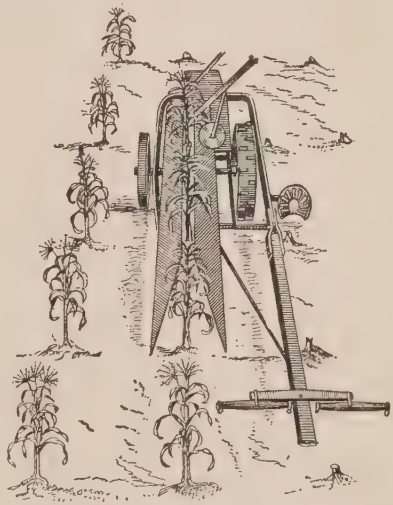
Cormorant, a web-footed bird related to the pelican, that feeds like a glutton on fish, which it catches by swimming and diving. It has a strong, hooked bill, long neck, short wings and a rather long round tail. Its plumage is blackish, but the face is usually naked and brightly colored. It is very widely distributed; some forms live inland by rivers and lakes, others on the seacoast and about islands. Some of the cormorants of the United States live in pairs, but more often in great flocks, flying around vessels at sea in great numbers. They are also called shags. The Chinese breed and train them for fishing. A ring of hemp is tied around the neck to prevent them from swallowing the fish, and, for two or three hours at a time, they will dive and bring up fish in their bills, which are taken into the boat by the fishermen. Fish too large to be managed by one are attacked by two or three birds at a time. In 1898 a very large non-flying cormorant was discovered on one of the Galapagos Islands. The bird is rare

CORMORANT

Corn, Indian, or Maize, the original name of corn or *Zea Mays*, a species of the grass family. Corn is said to have become the most important food-plant, next to rice. It is now almost unanimously conceded that it originated in America and is probably native to Mexico. Corn was found in cultivation by the Indians upon the discovery of America, and has continued to be called Indian corn; in fact the name maize is seldom used in America. Although very numerous varieties have been developed, they are all considered to have been derived from a single species. The commonly used classification is as follows: pod-corns, pop-corns, flint-corns, dent-corns, soft-corns, sweet or sugar-corns, starchy sweet-corns. Sweet corn is distinguished from the ordinary field-varieties by its wrinkled or shiveled kernel and its somewhat translucent appearance. The pop-corn is characterized by the excessive development of the horny region of the endosperm and by the very small size of the kernels and ears. Corn is hardly less a staple food than is rice in tropical countries, while in colder countries it is rapidly becoming popular. It is thought to be more nutritious than barley, buckwheat or rye. It is more generally used in America than in other continents. In the United States the annual crop is over 2,700,000,000 bushels, or about two thirds of all the grains grown. When coarsely ground, corn forms hominy; when finely ground, corn-meal. Pop-corn is a variety whose grains, when roasted, swell and burst, turning inside out. However, the greatest use of corn in America, is as a food for cattle, sheep and hogs. Large quantities of starch are made from corn. This is used for food and for laundry-work, while a good part of it is made into grape-sugar or glucose. The dried leaves and stalks of corn furnish a supply of cattle-fodder. The husks are used for packing and for mattresses; while in South America they are also used for cigarettes. The cobs make popular pipe-bowls for tobacco. Corn was introduced into Europe by Columbus; but there is good ground for believing that the maize plant was known in Asia and Africa before that time.

CORN

Corn-Harvester. Among the many labor-saving machines which have so greatly aided modern agriculture is that known as the corn-harvester. One type of these machines cuts the corn and binds the stalks in bundles ready for shocking. Another type cuts and shocks the corn without binding it into bundles. With the use of one of these machines a single man with a team may easily cut eight or ten acres of corn in a day, doing the work of four to eight men by former hand-methods. The illustration shows the cutting mechanism of one of these machines. The edges of the side-knives are at an angle to the line of draft, and as the machine advances the knives move with a shear-cut against the corn-stalks, severing them. They are then carried away by a conveyor and bound in bundles.



CUTTING MECHANISM OF CORN-HARVESTER

Corneille (*kôr'nāl'*), **Pierre,** the greatest French tragedian and the founder of French comedy, was born at Rouen, June 6, 1606. His ill-success as a lawyer sent him to Paris in 1629, where his first comedy was produced and acted in two theaters at the same time. In 1636 *The Cid*, his most popular tragedy, took Paris by storm, and in spite of Richelieu, a personal enemy of the author, and in spite also of the Academy, his creature, could not be suppressed; and soon "fine as the Cid" became a common saying. *Le Menteur* showed the author to be great in comedy as well as in tragedy. *Polyeucte* and *Rodogune* are others of his best works; while the finest verses he wrote occur in the central love-scene of *Psyche*. *Horace* and *Cinna* are also favorite productions of Corneille. Strength and sublimity are his chief characteristics.

Corne'lia. See GRACCHI.

Corne'lius, Peter von, one of the first masters of the modern German school of painting, was born at Düsseldorf, Sept. 23, 1783. When but 19 years old, he

painted some fine frescoes in an old church. In Munich he painted his greatest works—a series of frescoes based on the stories of the Greek gods and heroes, and another series of New Testament scenes from the Incarnation to the Judgment, the latter being the largest fresco in the world. He achieved fame also by his *Four Riders of the Apocalypse*, painted in Berlin. More important than his paintings, perhaps, was the impetus he gave to wall-decoration. He died at Berlin March 6, 1867.

Cornell, Ezra, American philanthropist and founder of Cornell University, was born at Westchester Landing, N. Y., Jan. 11, 1807, and died at Ithaca, N. Y., Dec. 9, 1874. He settled in Ithaca as a mechanic and miller in 1828, and early took an active part in the construction of telegraph lines, in which, and in connection with the Western Union Telegraph Co., of which he was the founder, he amassed a fortune. Early in the sixties he was a member of the state assembly, and later was elected to the state senate. In 1865 he gave half a million dollars, afterward much augmented, to found the university at Ithaca, N. Y., which bears his name, and to which Congress made an appropriation of land. The institution opened in 1868.

Cornell University, is located on Cayuga Lake, at Ithaca, N. Y. It was chartered in 1865 and 1867, and with ample endowment, including the income from a grant of nearly a million acres of land, it rapidly took rank with the first educational institutions of the country. It was named after Ezra Cornell, who gave a large sum toward its endowment, and whose able management was largely instrumental in placing the institution on a sound financial basis. Besides the academic department it has Colleges of Law, Medicine, Agriculture, Veterinary Medicine, Architecture, Civil and Mechanical Engineering. The teachers number 750, and the students 6,891.

Cor'net, a musical instrument, usually of brass and originally curved like a horn. The best form is known as the cornet-à-pistons, because changes of sound are made by manipulating pistons with the fingers. It has a compass of two octaves and two notes. It is not an instrument of especially fine or delicate sound; but in orchestras, in company with other instruments, its effect is excellent.

Corn'ing, N. Y., a growing town in western central New York, one of the capitals of Steuben County, 17 miles west of Elmira. It is situated on the Chemung River, and has a number of factories, including railroad-car-shops, brick and terra-cotta works. The leading industry, glassware manufacture, employs upwards of 2,000 people. It has good educational facilities and an active civic life. It has the service of three railroads. Population, 14,666.

Corn'planter, a half-breed Seneca Indian and chief of the Six Nations. He was born about 1732, and was the son of John Abeel, a white trader. He fought the English at Braddock's defeat, and was a deadly foe to the colonists during the Revolutionary War; but afterward became a steady friend of the white people. He was an intelligent, dignified and moral man. He died on Feb. 18, 1836. Pennsylvania erected a monument in his honor in 1867.

Cornu (*kôr'nü'*), **Marie-Alfred,** distinguished French physicist, head of the department of physics at the *École Polytechnique*, the great military school of Paris. He was born on March 6, 1841, and was educated at the institution where he later taught. Cornu's investigations cover a large range of optical and acoustical subjects. Among the most important of these may be mentioned his very accurate determination of the speed of light by the method of Fizeau; his determination of the density of the earth by the Cavendish method; his study of the solar spectrum and the ultra-violet spectra of the metals; and his mathematical discussion of the diffraction-grating. Besides being a member of many learned societies, Cornu was a prominent member of the French Academy, and was president of the International Congress of Physicists which met at Paris in 1900. He died in 1902.

Cornwall Canal. This Canadian canal extends past the Long Sault rapids from Cornwall to Dickinson's Landing. From the head of the Soulanges to the foot of the Cornwall Canal there is a stretch through Lake St. Francis of 32¾ miles, which is being made navigable for vessels drawing 14 feet. The length of the canal is eleven miles. It has six locks 270 by 45 feet. The total rise or lockage is 48 feet. The depth of water on the sill is 14 feet. It is 100 feet wide at the bottom and 164 at water surface. See LACHINE and SOULANGES.

Cornwall, county-seat of Dundas, Stormont and Glengarry Counties, Ont., is situated on the north bank of the St. Lawrence River at the foot of the Long Sault rapids, and has a population of 6,704 people, largely engaged in manufacturing. It is on the Grand Trunk and Ottawa & New York railways. Its leading industries are cotton, woolens, paper, machinery and pottery.

Corn'wallis, Charles, Marquis, was born at London, Dec. 31, 1738. He served in the Seven Years' War, and accepted an appointment as major-general in America, though he disliked forcing taxes on the colonists. He was the ablest British general in command, winning the battle of Camden against General Gates, gaining a slight advantage over Greene at Guilford, but being forced to surrender at Yorktown

in 1781. He afterward was governor-general of India, where, by his victories over Tippoo Sahib, he probably saved India to the English. Made lord-lieutenant of Ireland, he put down the rebellion of 1798, and gained the good-will of the Irish. The ability of Cornwallis in India and in Ireland shows that his failure in America was largely due to the poor generalship of his superior officers, Howe and Clinton. Cornwallis died on Oct. 5, 1805, while on his way to the Indian upper provinces, having been made governor-general a second time.

a, a. Corollas with free petals
b, b. Corollas with petals united.

Coroi'la (in plants), the inner set of the two floral envelopes, which usually forms the showy part of the flower. The individual parts are called petals. See FLOWER.

Coronado (*dâ kō'rō nä'thō*), **Francisco de,** a Spaniard, born in Salamanca probably about A. D. 1510, was the leader of a pioneer force of troops which, starting from Mexico, did much to explore the unknown region which now is the southwest portion of the United States. The expedition appears to have advanced as far as what now is Kansas. Coronado saw the possibilities of the land which he visited for agriculture; but he was disappointed in his search for precious metals. His papers give the first reliable account of the American bison or buffalo. The latter part of the life of Coronado was spent in retirement, and the date of his death is uncertain. For the papers of this expedition see *The Coronado Expedition* (Winship) in *Reports of the U. S. Bureau of Ethnology, No* 14.

Corot (*kō'rō'*), **Jean Baptiste Camille,** a French landscape-painter, was born at Paris, July 28, 1796. He was first a clerk in a dry-goods store, but his tastes led him early to study art. His paintings made their way slowly, but wealth and fame finally came to him. Corot's landscapes were true copies of nature. His favorite subjects were misty lakes, rivers smothered in vapor and the quiet of moonlight or sunrise, which he painted as a poet would have written of them. He had great influence on young French artists, who admired and liked him for his genius, kindliness and generosity. At one time they gave him a medal of their own when the Salon had passed him by, and they always called him Father Corot. Among his masterpieces are *The Dance of Nymphs* and *Macbeth.* He died on Feb. 22, 1875.

Corporations. Corporations were known to the laws of ancient Rome; but it is only of late, and especially in the United States, that their value as an instrument of commerce as well as their danger to the public welfare has been fully realized. We seem to be in a fair way to preserve the use and to prevent the great abuse of corporate power. A corporation is distinguished from the ordinary partnership in that it is, in the eyes of the law, a distinct *person*, created by the act of incorporation. It continues, though all the original shareholders have died, its acts are to be considered quite distinct from those of the shareholders, it may sue or be sued in the courts. In one sense it is even a citizen, for it has in general the privileges guaranteed by the constitution of appealing to the supreme court against any state action which the constitution forbids. But this citizenship it does not possess in one matter. It cannot claim the right to do business in any state under the same conditions as those that govern citizens of that state. Thus Texas may pass one set of laws for corporations incorporated within its limits, and another for all other corporations, and forbid their entrance to the state on any other conditions. However, by the interstate commerce provision of the constitution, the products of a corporation of another state may not be excluded from any state, except under conditions that apply to all persons alike. A partnership, on the contrary, is not a distinct person, and the several members are liable to suit for the actions of their partners in whatever business they have agreed to be partners. A joint-stock company, in like manner, is not a separate person, and the members are liable to be sued for its acts, though they are not held to be responsible for all the acts of the company's officers as a partner is responsible for his partner's acts.

At present the Federal government does not incorporate; that is left to the several states. In some states every corporation must be established by a special act of the legislature; but it is now common to lay down by statute the conditions of incorporation and then, whenever those conditions have been fulfilled, the corporation is by that fact established. The act of incorporation has been held by the supreme court to be a contract between the state and the corporation, and it cannot therefore be broken. The state must therefore arrange for the control that it desires to exercise over corporations before the corporation comes into existence. It is here that we have failed. New Jersey, above all other states, offered exceptionally favorable terms to corporations if they would incorporate under her laws, so as to give her the benefit of the taxes

that might be imposed on them. New York was compelled to follow suit, in part, for the same purpose. Other states have joined in this attempt to offer favorable terms with the result that proper provisions for control have not been inserted. The failure to insert proper provisions when incorporating many of the railroads has been especially injurious. It is largely as a result of these mistakes of the state governments, and also because of their inability to agree upon a single line of action toward corporations, that the Federal government has been obliged to take action in the matter. Practically all great trading corporations deal in interstate commerce, and Congress has control over such commerce and thus, indirectly, over such corporations. It has been *proposed* that all corporations that have interstate commerce be required to receive incorporation from the Federal government.

Corporations may be divided into sole and aggregate. A sole corporation exists where, for example, the Secretary of War in England *with his successors* is a corporation. Most corporations have many members and are *aggregate*. These are divided into public and private corporations, of which the former include, for example, cities and villages, which are conducted by the public for the public good. There also are eleemosynary corporations which are run by *private* individuals for the public good, as colleges, churches. The savings-banks in like manner are eleemosynary.

Corpus Christi, Texas, a city and county-seat of Nueces County, 149 miles from San Antonio. It is located at the mouth of the Nueces River, on Nueces and Corpus Christi Bays. It is the trading-center of a fine agricultural and stock-raising region, and its fish-packing business is very large. The city has good public schools, a convent, several churches, etc. It is served by four railroads, and has a regular freight steamer service with New Orleans. Population at the present time is 20,000.

Correggio (*kŏr-rĕd'jō*), **Antonio Allegri da,** was named from his birthplace, Correggio, near Modena, Italy. He was born in 1494, and, as his father was well-off and his uncle an artist, Antonio seems to have had none of those struggles with poverty that have hampered so many painters. In 1518 he painted a salon in the convent of San Paolo in Parma. The groups of goddesses, graces and nymphs were painted with a fullness of life, gaiety and grace, at that time unknown, that at once stamped him as a genius. In 1522 he began his famous decoration of Parma's cathedral, painting in the main dome his *Assumption of the Virgin*—the Madonna borne up to heaven by a countless throng of rejoicing angels, while the Savior descends to meet her. This is deemed the painter's masterpiece, and Titian, when he first saw it, said: "If I were not Titian, I would be Correggio." *The Night, Il Giorno* and *The Reading Magdalene* are among his best-known pictures. In Correggio's art there are a wonderful gaiety and a sunny charm; he was a master of light and shadow; and hardly any artist equaled him in painting human flesh. He died on March 5, 1534.

ARCHBISHOP CORRIGAN

Cor'rigan, Michael Augustine, Roman Catholic archbishop of New York, was born at Newark, N. J., Aug. 13, 1839, and educated at St. Mary's College, Wilmington, Del. In 1863 he was ordained to the priesthood at Rome, and, after holding the chair of dogmatic theology and subsequently the presidency in Seton Hall College, Orange, N. J., he was appointed by Pope Pius IX to the see of Newark in 1873. Seven years later he became coadjutor to Cardinal McCloskey, and, on the death of the latter, was made metropolitan of the diocese of New York in 1885. He died on May 5th, 1902.

Correlation of Studies. In modern methods of teaching the attempt is made to relate together those portions of the subject-matter of the curriculum which appeal to the same human interest. Thus it is evidently better, other things being equal, to teach the history and geography of a country in close connection with each other, rather than independently. The principle of relating portions of the curriculum to each other or to a common interest is called the correlation of studies. Correlation is one of the practical recommendations of the school of Herbart. Froebel also related the activities of the child as far as possible to a central object; but correlation is not the same conception for Froebel as for Herbart. For Herbart, correlation is based upon a theory of association of ideas in the individual mind. For, in order that the life of thought may possess unity and harmony, it seemed to Herbart that ideas should be associated according to a process to be directed by the teacher from without. In other words, instruction needs to be a deliberate endeavor to organize the pupil's ideas, and not merely to present them to him; since otherwise the house of thought and, hence, of will might be so divided against itself that it could not stand. But to Froebel, correlation appears to indicate just the recognition of the fundamental oneness of the individual with society. Correlation

is for him the process of carrying over the inward unity of the self to the field of its manifestation or liberation. According to this view, which has been expounded by Professor Dewey, the correlation of studies is not so much a process of relating them to each other as of relating them to life and to its needs and purposes. The child or the student will correlate subjects for himself. This, however, is no reason why the teacher should not assist him in so doing, as Herbart advised. The child will correlate his manual training with his geography more readily, if the teacher shows him on the map from what countries and by what routes the various species of woods which he uses are brought.

Special types of correlation are those known as *concentration*, in which the attempt is made to relate all the curriculum to one topic, and *co-ordination*, in which the subjects of the curriculum are arranged in several groups. As an example of the first type Ziller would make all the instruction of a pupil for one year to be grouped about the story of Robinson Crusoe. As an example of the second type Dr. Harris would subdivide the curriculum into five groups of equal value, so that the subjects in each group should be closely interrelated.

See *Report of Committee of Fifteen* of National Educational Association; also books of the Herbart Society.

Correspondence-Schools. The first regularly organized correspondence-courses appear to have been given by the Chautauqua Circles about 1880. Since that time this means of education has been adopted to a considerable extent by a number of colleges and universities, and by receiving credit for work thus done, many worthy students are enabled to earn university degrees who would otherwise be unable to do so. The University of Chicago offers a very large number and variety of correspondence-courses.

The greatest development of this method of instruction has been in the hands of private schools devoting their whole attention to the work. They send out instruction-papers especially designed for home-instruction. They require written answers to questions upon the work as soon as it has been mastered by the student, and these answers are sent to the instructor, corrected by him, and returned to the student. The instruction in most cases is satisfactory. It cannot be denied, however, that the successful pursuit of this method of study requires more than average perseverance on the part of the student. Many give up their courses before they are completed. It seems advisable in most cases to have the work divided into courses which can be completed in a comparatively short time and to require a course to be finished within a specified time, in order to furnish a stimulus to regular systematic work.

Some of the schools have advertised largely and gathered in students' fees, which were incompetent to give in return anything more than nominal service. Students intending to enroll in correspondence-courses should be on their guard against inferior or fraudulent schools of this kind. See CONTINUATION-SCHOOLS.

Corsica (*kôr'sĭ-kȧ*), an island and department of France in the Mediterranean, lying due south of Genoa and separated from Sardinia by the Strait of Bonifacio. Corsica (Corse in French, from the Greek *Cyrnus*) was the birthplace of Napoleon Bonaparte. Its surface is mountainous, and the island was long noted for its vendettas and brigands. Its products besides timber, include oranges, lemons and grapes,—the chief exports being wine and olive-oil. It has an area of 3,367 square miles; its length is 114 miles, and its breadth 52 miles. The capital is Ajaccio on the west coast; but the chief town is Bastia on the northeast portion of the island. The population, which speaks Italian mainly, is about 295,589. The island was acquired by the Romans at the close of the first Punic War, and was for periods held by Vandals, Goths, Franks, Saracens, Pisans and Genoese. France acquired it in 1768, but in 1793 it came for awhile under British rule; though three years later it was regained by France, which today maintains a torpedo-station on the island.

Cor'sica'na, Texas., the county seat of Navarro County, on St. Louis Southwestern, Trinity & Brazos Valley and Houston & Texas Central Railroads, 50 miles south-southeast of Dallas and 162 miles northeast of Austin. It has an Odd Fellows widows and orphans' home and a state orphan-asylum. Among its industries, besides planing, flour cotton and cottonseed-oil mills, are foundry and machine-shops, brick-yards and a grain-elevator. Population, 15,240.

Cortelyou, George Bruce. Born July 26, 1862, in New York; was educated in the schools of Hempstead, L. I. and in the Institute and state Normal School, Westfield, Mass. He was a law-reporter in New York City for a time, and from 1885 to 1889 he taught school in that city. He entered public service as a private secretary in 1889, and in 1895 was appointed stenographer to President Cleveland. He acted as private secretary to President McKinley and President Roosevelt; and, when the Department of Commerce and Labor was organized in 1903, he was appointed secretary of that department. In 1905 he became Postmaster-General, and in 1907 he was appointed Secretary of the Treasury. During the presidential campaign of 1904

Mr. Cortelyou was chairman of the Republican National Committee.

Cortes (*kôr'tēz*), **Hernando,** the conqueror of Mexico, was born in Medellin, Spain, in 1485. At 19 his longing for adventure sent him on a voyage to San Domingo, and soon after he joined Velasquez in the conquest of Cuba. Alvarado's glowing description of Mexico induced Velasquez to place Cortés at the head of a new expedition. On Nov. 18, 1518, Cortés sailed on one of the most daring adventures of history. He had 550 Spaniards, two or three hundred Indians, twelve or fifteen horses, ten brass guns and a few small cannon. At Trinidad he was astounded by orders from Velasquez to give up the command. Cortés refused to do this, and so cut himself from all hope, save in success. Landing, he fought his first battle at Tobasco, where he captured the beautiful and faithful Donna Marina, who became his interpreter. Soon messengers came from the king, Moctezuma, bringing rich presents but forbidding him to visit the capital. Here some of his men, who were friendly to Velasquez, wanted to turn back, but, taking them into his confidence, the commander told them that conquest, not mere trade, was what he was after, and so won them over. Founding Vera Cruz and burning his ships behind him, he marched to Tlascala, and after hard fighting subdued the country. Soon after, with some thousands of Tlascalans, now his allies, he set set out for Mexico. On Nov. 8, 1519, Cortés reached the capital, which seemed to the Spaniards like a dream or an enchanted castle. They saw before them a city of 300,000 people, in the middle of a great salt lake, approached by three causeways of solid masonry, from three to six miles long, with many wooden drawbridges. He had hardly been a week in the city, when, on the ground that Vera Cruz had been attacked, Moctezuma was carried to the Spanish quarters and put in irons. At first the Mexicans were stricken with fear of these strange men, with horses and cannon; but they soon saw that they were only men after all, and very few at that; so when Moctezuma had been imprisoned some five months, he begged the Spaniards to leave. Cortés asked for time, and learning that 18 ships had landed, sent by Velasquez, he left Alvarado in command, and with a handful of men set out for the coast. At Cholula, by a night-attack in a blinding storm, he defeated 800 fresh Spaniards, who gladly joined his troops. Two weeks later came the news that the Spanish quarter was besieged. On reaching the city, Cortés found himself face to face with the whole nation, led by Moctezuma's brother. After driving back with difficulty a fierce attack, he saw that he must leave the city. At midnight began the retreat over the causeway. Its three bridges had been destroyed by the Mexicans; the first was crossed by a pontoon, but at once the lake was covered with canoes, and so hot was the attack that at the second bridge the pontoon could not be raised. Soon the water was choked with struggling horses and men, and the retreat became a hopeless rout. Out of that fearful night a handful escaped to land, only to find themselves surrounded by a countless host. Yet they cut their way through, every man fighting as ten men would fight, and reached their friends, the Tlascalans. Six months later Cortés, with 10,000 Tlascalans, marched on Mexico again. Brigantines were built, attacks along the causeway were made and a regular siege begun; 50,000 Mexicans died from famine and pestilence; yet the city had to be destroyed before it was taken. At last it fell, after 75 days' siege, which for bravery ranks with any in the annals of war. The Spaniards entered, but found only ruined houses filled with heaps of dead. In 1528 Cortés visited Spain and was highly honored, but, though appointed captain-general, he was not made governor of New Spain, as Mexico was now called. The next ten years he was forced to stand by and see another's bungling government of the rich empire he had won. Meanwhile he discovered Lower California (1533). Disappointed, poor and in ill-health, he went back to Spain in 1540. He accompanied Charles V on his disastrous Algerian expedition, and, touched to the heart by the emperor's refusal to allow him to capture Algiers, answered: "I am a man who has given you more provinces than your ancestors left you cities." Cortés was no common adventurer, but a captain of great military genius and, withal, a statesman of deep foresight. He was cruel sometimes, and passionate, but patient, religious, simple in life, and worshiped by his soldiers and Indian allies. He died near Seville, Dec. 2, 1547.

Cor'tex (in plants). The tissues of stems and roots are arranged in three general regions. In the center is the woody cylinder, sometimes solid and sometimes containing a pith. Outside of the woody cylinder is the region of the cortex, containing the active cells; and about the cortex is the epidermis. In perennial plants, where bark is formed, the cork is developed in the cortex, and the epidermis disappears.

Cort'land, N. Y., a city, the county seat of Cortland County, on the Delaware, Lackawanna & Western and Lehigh Valley railroads, 35 miles south of Syracuse. Settled in the latter part of the 18th century, the city was in 1829 set off as Cortlandville. It has a state normal school and other educational institutions, together with the Hatch Public Library. Its manufactures

embrace carriage and wagon-shops, door and window-screen factories, besides wire and wire-cloth, wall-paper, drop-forgings and carriage-trimmings establishments. It is a shipping point also for agricultural and dairy produce. Population, 12,259.

Cor'win, Thomas, was born in Bourbon Co., Ky. in 1794, but was brought up in Ohio. He became a lawyer, and was noted both as a speaker at the bar and for his keenness in sifting and massing evidence. He was chosen state representative, member of Congress and later, senator, acting with the Whigs. He was opposed to the Mexican War as unjust. He was elected governor of Ohio after a thorough canvass, speaking in every county and delivering a brilliant speech in support of General Harrison, then Whig candidate for president. In 1850 he became secretary of the treasury under Fillmore. A member of Congress again, in 1858, and supporter of Lincoln in 1860, he was in favor of a compromise on the slavery question, which, he hoped, would avoid war. He became minister to Mexico in 1861, and died at Washington, D. C., Dec 18, 1865.

THOMAS CORWIN

Corymb (*kŏr'ĭmb*), a flat-topped flower cluster, in which the pedicels of the flowers are of different lengths, arising from the axis at different levels. The outer flowers bloom first. See INFLORESCENCE.

Coshoc'ton, Ohio, a city, the seat of Coshocton County, on the Muskingum River and on the Pittsburg, Cincinnati, Chicago & St. Louis and Wheeling & Lake Erie railways, about 70 miles east-northeast of Columbus. It was settled early in the last century and incorporated in 1833. Its manufactures include novelty-advertising establishments, wooden-novelty works, machine-shops, glass-factory and other "plants." It has a public library, churches and schools, and owns its own water-works. Population, 9,603.

Cos'sacks, a race first known in the 10th century in the region south of Poland and Muscovy. Their name has been said to mean an armed man, a coat, a saber, a goat, etc. Their race-stock is just as uncertain; probably they sprang from mixed Slavonic, Tartar and Circassian tribes, though some hold them to be Tartars, and others almost purely Russians. They fought against the Turks and Tartars, and were very powerful in the 15th century. Poland and Muscovy employed them to guard their boundaries; while Cossacks are to be met with in the outposts of Russia in Siberia, Central Asia and the Caucasus. Sometimes living near hostile peoples, they formed a cordon of settlements along the borders of territory they held; sometimes living in the midst of enemies, they gathered in separate camps, ever ready for attack or defense. They are a democratic people, choosing all their officers for one year only. Every Cossack, too, might be elected to any post, even the highest, that of hetman. There were two branches: the Little Russian and the Don Cossacks. Descendants of the Don Cossacks now form part of the cavalry of the Russian army, and stand fatigue, hunger, thirst and cold with the greatest patience. Though for a long time thought to be fierce savages, late travelers say that in ability, cleanliness and enterprise they are above the average Russians, and in the 18th century an Englishman who had lived with them affirmed that they were "a civilized and very gallant as well as sober people."

Costa Rica (*kos'tà rē'kà*) (meaning rich coast), a republic of Central America, reaching from the Atlantic to the Pacific, with Nicaragua on the north and Panama on the south. It has an area of 18,400 square miles. Aside from the few Indians, the people are sprung from the Spanish settlers. The country is rich in gold, silver and copper, but its chief trade is in coffee, bananas and bar-gold, and it has been called the Coffee Republic. Costa Rica was discovered by Columbus, and a settlement was founded, probably in 1502, on his fourth voyage. It became free from Spain in 1821, and has had several constitutions, with a president and congress chosen every four years. It is held to be the best governed republic in Central America, though it is in default in meeting the principal and interest of its public debt. Costa Rica has an army of 1,000 men (infantry and artillery) besides 5,000 militia; though on a war-footing the republic can command about 150,000 militia. The state also has one gunboat and one torpedo-boat. In 1909 the value of its exports was $8,176,257; while its imports amounted to $6,109,938. There are 75 post-offices. The railways extend about 300 miles. The bulk of the trade is with the United States the latter supplying Costa Rica with breadstuffs and ironwork. The state-church is Roman Catholic. The capital is San José (population, 26,682). The other chief towns are Cartago, Alajuela, Limon, Puntarenas and Heredia. Population, 351,176 and about 3,500 aborigines.

Cotes, Mrs. Everard (*née* Sara Jeanette Duncan), Canadian and, latterly, an Anglo-Indian, novelist, was born at Brant-

ford, Ontario, in 1861, and educated at its Collegiate Institute. Early in the eighties she began to write for Canadian magazines and to act as staff-correspondent for Toronto and Montreal newspapers. Her cleverness, fine perception of the weaknesses and eccentricities of human nature and her pervasive humor obtained a connection with the English press and the appointment to act for a literary syndicate in making a tour of the world. The result of the tour appeared in *A Social Departure* and subsequently in *An American Girl in London.* Her later works include *The Simple Adventures of a Mem-Sahib; Vernon's Aunt; A Daughter of To-day; His Honor and a Lady; A Voyage of Consolation* and a delightful book on the author's Indian garden. In 1890 she married the editor of a Calcutta newspaper, a scientist, and has since made India her home.

Cotopaxi (*kō'tō-păks'ē*), the highest volcano in the world, is a peak of the Andes, in Ecuador, 33 miles from Quito. The earliest volcanic outburst of which we know took place in 1532 and 1533. Many others have happened since. In 1744 its thunderings could be heard 500 miles away; in 1768 occurred the worst eruption, when ashes were carried 130 miles. The mountain is a perfect snow-crowned cone. Smoke can be seen issuing from the crater, sounds like explosions are sometimes heard, and at night a glow is noticed on the sky above the volcano. There is little lava, but during an outburst flame, smok and great quantities of ashes are thrown out. Cotopaxi was first climbed in 1872 by Wilhelm Reiss, who gives the height of the northwest peak as 19,498 feet and the southwest peak as 19,429 feet. The last eruptions were in 1877.

Cotton. As early as 1500 B. C. the people of India—and by 1200 B. C. the Greeks, Phoenicians and Egyptians—with primitive appliances, were making cotton cloth of a quality which has been surpassed only by the most skillful manufacturers during the last half century. Cotton either in its wild or cultivated state was used at the date of the discovery of America in practically every country within the 40th parallels of north and south latitude, except in what is now the United States.

COTTON PLANT

Cotton is now cultivated in the United States on nearly all kinds of soils, south of latitude 37, artificial fertilizers being used to increase the yield, or hasten ripening on soils not naturally adapted to it.

THE COTTON QUEEN AND HER DRESSES

The plant belongs to the *Malvaceae*, or Mallow family, and is known by the generic name *Gossipium.* It is a perennial, but under cultivation usually becomes an annual or biennial. Culture in the United States is practically confined to two species, the silky, long-staple Sea Island cotton—*G. barbadence*—grown in the lowland coasts and coastal islands of Georgia and South Carolina; and Upland cotton—*G. hirsutum*—which is of two sorts, short cotton and Upland long-staple cotton. The flowers somewhat resemble single holly-hock blooms and continue to form until frost, opening their pale creamy petals one morning in full maturity for insect pollination, fading to pink by noon, dark pink the second day, and by night are shrivelled ready to be pushed off in a few days by the swelling fruit or boll. Bolls vary from almost spherical to long narrow pointed capsules and are divided into 3, 4 or 5 segments. When the bolls split and the fibres fluff into a twisted mass, the cotton is ready for picking.

ON THE PLANTATION

Cotton requires six or seven months of favorable growing weather between spring and fall frost to mature, but picking may extend far into the winter. It thrives in a very warm or even hot temperature, provided the atmosphere is moist, but it will mature a crop on less water than any other crop plant. Any sudden change in temperature, moisture or cultural methods is apt to cause an abortion of the young fruit and flowers.

Usually cotton is planted on ridges or "beds." Fertilizers, when used, are generally drilled into the beds just before planting. The seed are usually drilled in—about one bushel per acre. When the plants are three or four inches high they are hoed or "chopped" out, single plants being left standing from 12 to 24 inches apart, distance depending upon luxuriance of growth and type of cotton

Generally speaking the best concentrated fertilizer to be used is one containing soluble phosphoric acid, available potash and available nitrogen, although the nitrogen may be omitted if it has been previously supplied with green manure, legumes or barnyard manure.

COTTON PICKING AND GINNING

Mechanical pickers have been devised, but do not show the discrimination of the human being in avoiding immature cotton, nor adaptability to the irregularities of the average cotton field. After picking, the cotton is hauled in large boxed wagons to the gin (see ELI WHITNEY). It is sucked from the wagon through long tubes and distributed directly to the several gins in the gin house. A continuation of this sucking or blowing apparatus collects the ginned cotton and passes it to the compress

where it is compressed in large boxes. From the box it is swung around to the baler, further compressed, covered with coarse burlap and bound with metal straps. Each bale weighing about 500 lbs. is marked for identification and with its actual weight.

HOW COTTON IS BOUGHT

Cotton, the fibers of which are not over 1⅛ inches long is known as short cotton and is sold by grade from samples taken from each bale. Grading is based on color and relative amount of trash and stained fibers present. Short cotton constitutes the great bulk of that produced in this country and is used in making the cheaper grades of goods. Additional factors of length, strength and uniformity of fiber enter into the value of long staple cottons, premiums generally being given for each $\frac{1}{16}$ inch in length. The finer fabrics, including muslins and laces (*q. v.*) are made from long staple cotton.

The linters or fuzz remaining on the seed of Upland cotton after ginning yields batting, wadding, stuffing for pads, etc., and "lambs wool" for fleece-lined underwear. The hulls are used in cattle feed, fertilizers and paper stock. From the seed oil is made, which is used in lard compounds, cooking and salad oils and soap stocks, while the "cake" (residue after pressing the oil from the kernels) is used in fertilizers, dye stuffs, cattle and poultry feed, confectionery and flour.

ENEMIES OF COTTON

Cotton is subject to diseases, such as leaf blight, shedding of bolls, root, and boll rot and root galls.

The principal insect enemies are the cotton worm, the boll worm, and the Mexican boll weevil. Of these, the weevil is the worst, but by community effort the number of early weevils may generally be so reduced that a crop may be well advanced before the insects become hopelessly abundant.

G. S. MELOY
U. S. Department of Agriculture.

Cotton, John (1585–1652), an eminent Puritan minister, was for 20 years pastor of Boston in Lincolnshire, England, and for almost as long in Boston, New England. Cotton, whose Puritan leanings made him an object of suspicion under the primacy of Laud, was to have been brought before the Court of High Commission for trial. He escaped, however, to London and, later, to Boston, New England. Both in England and in New England, the reputation of Cotton for learning was of the highest. He had an absolute command of Latin, Greek and Hebrew; and loved "to sweeten his mouth with a piece of Calvin" at the close of his day of twelve hours' study. Cotton opposed Anne Hutchinson, whom he had at first been disposed to favor; and disputed also with Roger Williams. Among his many works was the catechism *Milk for Babes.*

Cottonworm, the larva of a moth doing great damage to the cotton-plant by eating the foliage. It is estimated by officials of the United States government that the loss occasioned by this insect in a year of great abundance of cotton-plants amounts to 30 million dollars. The average loss is placed at 15 million dollars. The perfect insect is a small, brownish moth, which flies at night and deposits eggs on the under side of the leaves of the cotton-plant. These eggs hatch in mid-summer within three days, and at once is begun the destruction of the leaves. The larva, when full-grown, is about an inch and three fourths in length, of a light-green color, striped with white and black and spotted with black and yellow. When through feeding, the caterpillar folds a leaf about itself, spins a cocoon and pupates; shortly after emerging, the moth lays her eggs. There may be seven broods in a single season. A related species destroys cotton in the ball. See Riley: *Entomological Commission's 4th Report* (Washington, 1885); *Bulletin No.* 18, New Series (Washington, 1898).

Cotyledon (*kŏt'ĭ-lē' dŏn*), the first leaf or leaves developed by an embryo. In seed-plants the cotyledons are developed in the seed, and are more or less different from the usual leaf-form, often being fleshy from containing stored food, as in the bean and acorn. Generally the cotyledons escape from the seed during its germination, but in some cases, as in the acorn, they never leave the seed. See EMBRYO.

Couch, Darius Nash, an American general, was born on July 23, 1822, in Putnam County, New York; and died at Norwalk, Conn., Feb. 12, 1897. After graduating at West Point, he served in the Mexican War as lieutenant of artillery. He entered the Civil War as colonel of the 7th Massachusetts. He took part in the battles of Yorktown, Williamsburg, Fair Oaks, Malvern Hill, Fredericksburg and Chancellorsville. He was made major-general in 1862, and was in command of a division in the battle of Nashville.

ELLIOTT COUES

Coues (*kouz*), **Elliott,** a notable American ornithologist, was born at Portsmouth, N. H., Sept. 9, 1842; and died at Baltimore, Md., Dec. 25, 1899. After graduating at Columbian University, Washington, D. C., in 1861, he entered the military medical service, and was for a time surgeon and naturalist on the U. S. northern-boundary commission He was

subsequently collaborator at the Smithsonian Institution, and secretary and naturalist to the U. S. geological and geographical survey of the territories; was chairman of committee at the Psychical Science congress in 1893; and edited a number of works in biology and on comparative anatomy and zoology. His writings embrace a number of works on his specialty of ornithology, among which are a *Key to North American Birds; Birds of the Northwest and of the Colorado Valley; New England Bird Life; Fur-Bearing Animals.*

Coul'ter, John Merle, a great authority on American botany and head-professor of botany at the University of Chicago, was born at Ningpo, China, of American parentage, Nov. 20, 1851. After graduating at Hanover College, Indiana, he spent a year as botanist on the U. S. geological survey in the Rocky Mountains. He was afterward successively professor of natural sciences in his *alma mater;* professor of biology at Wabash College; president of the University of Indiana; and president (1893-96) of Lake Forest University. Since 1896 he has been attached to the University of Chicago, in charge of his special department. His published works include a *Synopsis of the Flora of Colorado;* a *Manual of Rocky Mountain Botany; Handbook of Plant Dissection; Manual of the Botany of Western Texas;* and an edition, as editor, of Gray's *Manual of Botany.*

Coun'cil Bluffs, a city of Pottawattomie County, Iowa, lies not far from the old meeting-point of the Indian tribes. Here the Mormons tarried from 1846 to 1849, while on their way to Utah. For many years it was the last village in civilized America, and here California emigrants and trappers got their outfits before entering the Indian country. It lies across the Missouri from Omaha, Neb. Six railroads, running west from Chicago, here meet the Union Pacific line, and others turn to the north and south. The city's industries include manufactures of paper, iron, carriages and agricultural machines. Population, 32,000.

Courthope (*kōrt'ŏp*), **William John,** an English critic and man-of-letters, was born in Sussex, England, July 17, 1842, and educated at Harrow and Oxford. At the latter he won the chancellor's gold medal for verse, and also was Newdigate prizeman. He was one of the founders of the English *National Review* and a staff member of the *Quarterly Review;* subsequently he was appointed civil-service examiner in the government education department, and was made a Companion of the Bath. From 1895 to 1901 he was professor of poetry in the University of Oxford. He has edited an elaborate edition of *Pope's Works, with Life;* a *Life of Addison* (in the English Men of Letters Series); a *History of English Poetry;* and a burlesque in allegory, entitled *The Paradise of Birds.*

Courtney, The Right Reverend Frederick, Bishop. Rector, St. James Church, New York. Born at Plymouth, England, in 1837. Graduated from Kings College, London, 1863. Came to New York in 1876 as assistant at St. Thomas' Church. Was made Rector of St. Paul's, Boston, in 1882, and bishop of Nova Scotia, 1888 to 1904, attended the Lambeth Conference in 1888. He holds honorary degrees from several universities, and is much admired as preacher and bishop.

Courts of Justice. Courts of justice in primitive times either were the people assembled or the king and his advisers. Their activity has always been of two kinds: either to punish or to arbitrate. Criminal cases are those in which the community punishes the offender; civil cases, those in which the community decides a dispute. In early days the court was all important; but when the community entrusted justice to a few specially selected men, it laid down laws by which they should be in part guided; and those selected men laid down further rules to guide their successors. So that now a court of justice is always subordinate to a system of law and precedents, which it may not alter, but which it must *interpret* to fit the case before it. In the early Roman republic the people's assembly, the *comitia,* tried all important cases. In the Roman empire there was established a regular system of courts, in which we may distinguish courts of *original jurisdiction* and courts of *appeal.* The former try cases at first hand. An appeal may be taken only from an inferior to a superior court. The Romans also established a distinction still preserved between common law and equity; the former being the laws and customs current in the community, and the latter principles of justice laid down by judges at various times and finally brought together in a system.

Our Teutonic ancestors preserved through the middle ages the right of being tried, not indeed by the whole people, but by some of them, usually six or more, of about the same rank as the accused. That is, they were his peers. This *trial by jury* Englishmen especially held precious, and we in America still regard it as necessary to securing justice. (See the Constitution, Article III, Section 2, and Amendments V, VI and VII). On the continent of Europe, except in the cities, the model generally followed was that of the courts of the church, in which the essential thing was a trained judge. Since the French Revolution, however, the jury-system has become common on the continent.

As our system of courts is largely derived from that of England, we may note

that in that country the lowest court is everywhere the justice of the peace, who in the cities is called a police-magistrate. He deals chiefly with minor offenses and also settles many civil disputes in small matters. But disputes concerning matters that must be entered on the public and permanent records, such as the right to real estate, wills, divorces, etc., are referred at once to local *courts of record*, the borough or county courts. These are called inferior courts. These courts also deal with offenses of greater importance.

Since 1873 the superior courts include the *Supreme Court*. This includes "His Majesty's High Court of Justice," which has such divisions as the Chancery division (dealing chiefly with cases of *equity*), the Kings Bench (or *common law* division), the probate (*wills*) and the admiralty (*navigation*) divisions. All these courts have original jurisdiction. The Court of Appeals includes several divisional courts, and also a final Court of Appeals, the highest regular court in the Kingdom. But in some cases the matter may be appealed to the House of Lords, and in cases affecting India, the colonies and foreign countries the Privy Council is the final court.

In England all judges are appointed, and appointed for life. The English believe with some reason that they have thereby secured a more honest and a more able administration of justice.

The United States courts either are Federal or state courts. In state courts, except that the judges or justices are elected by the people, in most cases for a term of years, the lower courts are very like those of England, both in name and in powers. In some states, the county-judges receive such names as judge of quarter-sessions. But the essential point is that he is a judge of record and that he tries more important cases but not, as a rule, the most important cases.

In some states these county-courts have, besides the above powers, those of a circuit or superior court. Commonly, however, the superior or *circuit-courts* are distinct. They are elected by a larger division of the state, containing several counties, and for longer terms. They have original jurisdiction in the most important cases. There is finally a system of *courts of appeal*, including two or more divisional courts, and then a final court of impeachment for the trial of judges and of the executive. The distinction between courts of law and courts of equity is preserved only in a few states. Most states have a special county-judge for dealing with the property of persons deceased. His court has various names, as surrogate's, prerogative or orphan's court. In general, the higher judges are elected or appointed for longer terms. In many states they hold office for life and during good behavior. In a few cases they are elected, not by the people, but by the legislature. In a few others the governor appoints them.

Federal courts include the senate as a court of impeachment (see CONGRESS), the Supreme Court, the Court of Claims, Commerce-Court and District-Courts. The Supreme Court consists of nine judges, the Chief-Justice and eight associates; but the number may be increased at the will of Congress; which also may, on the death or retirement of a justice, refuse to provide for a successor. The justices are nominated by the president and confirmed by the senate. They are appointed for life, but may be removed by impeachment. All federal judges are thus appointed. The supreme court was established by the constitution, and cannot be abolished by Congress; but the circuit and district-courts as well as the court of claims may be so abolished. The supreme court sits at Washington from October to July each year. There are nine circuit-courts, to each of which a supreme-court justice is assigned. There are 25 circuit-judges (1903). Each circuit has two kinds of courts: (1) a court of orginal jurisdiction, which may consist of the supreme-court justice of the circuit, or a circuit-judge, or a district-judge of the circuit or any two of them; (2) a circuit-court of appeals, to which cases from the first class or from district-courts may be appealed. This consists of three judges of the circuit, but must not include the judge who tried the case. There are 69 district-courts, with a judge, clerk, marshal and attorney. Appeals may be made from the district-court to the circuit-court of appeal; and in important cases from that court to the supreme court. The court of claims deals with claims of private persons against the Federal government; appeals from its decisions are direct to the supreme court. The courts in the territories and in the District of Columbia are established by Congress, but are not Federal courts. The judges serve for four years; whereas all Federal judges are appointed for life. The Federal courts may only try cases which are directly removed by the constitution from the decision of the state-courts. Wherever a state-court faces the question of whether a Federal treaty or statute or act of authority is valid or applicable to a case in dispute, and decides that it is not valid or is not applicable, then the person who claims that it is, has the right of appeal to the Federal court, as a state is not competent to decide on such a matter. However, no person has the right to force a state into the courts (Eleventh Amendment). In all criminal cases and suits at common law before a Federal court, a Federal jury must be summoned to try the

case. The supreme court tries all cases concerning ambassadors and other ministers from foreign countries and all cases where a state brings action against another state or the citizens of another state or a foreign country. In these cases the suit is at once brought before the supreme court; but in other cases—which include, besides those mentioned already, cases that involve laws of navigation and controversies wherein the United States is a party—in all such cases the state-courts or lower Federal courts must try the matter first, and appeal may then be made according to the principles already mentioned.

The Federal courts do not create laws, and are bound even more strictly than state-courts to interpreting the law, viz., the constitution and the enactments of Congress, always preserving the sovereignty of the constitution. It is wrong to speak of the supreme court as superior to Congress, in contrast with the British courts, which are subordinate to Parliament. The difference is that in England the Parliament is superior to all authority whatsoever, there being no constitution to overrule it, while in America, Congress and the supreme court alike are subject to the constitution. Of course the will of the people is the final judge in both countries. At the same time, because the supreme court has the duty of interpreting the constitution, which needs a great deal of interpreting to apply it to all the changes of modern life, it has in fact a great deal to say as to what regulations shall govern us. For example, the constitution does not forbid, explicitly, a graduated income-tax; but the supreme court forbids it by its interpretation of the constitution. The constitution being difficult to amend, that interpretation, and nothing else, prevented at one time the collecting of such a tax.

In like manner the state-courts of every state have the power of interpreting the constitution of the state and of deciding whether the acts of the legislature and executive are in accordance with it. Whenever Federal or state-courts decide against the constitutionality of an act, it is void, as if it had never been passed or done. But it is the rule that where there is doubt in the matter, the benefit of the doubt is to be given to the act or statute.

PERCY HUGHES.

Courts-Martial, in their modern form, as regular tribunals set up by Congress or in minor cases by a military or naval commander, for the trial of offences against martial law or discipline in the army, navy or marines, date from an ordinance of Charles I, and are referred to in the first mutiny-act of William and Mary. Both in America and England there are several grades of courts-martial. In the highest or general courts, the more serious offences and also all charges against commissioned officers are tried. Often, when evidence is to be gathered, courts of inquiry are set up for this purpose. These courts in America may summon witnesses upon oath; but in England they have no such legal powers. When sentence of death is decreed, it is usually by shooting. The old-fashioned drumhead courts-martial, held upon the field before passion had time to cool and before full evidence could be gathered, are no longer held. Summary courts may, however, be held, in America in the place of regimental and garrison courts, and in the British army chiefly to try offences committed upon active service abroad, when it is difficult to have the offenders tried in the ordinary courts. The more serious offences are never tried by such courts, which in the United States consist of but a single officer. Courts-martial have the defect that their members belong to one and the same class, and may have a special army or navy sentiment. In 1757 Admiral Byng was sacrificed by an English court-martial to popular clamor, and shot, having perhaps made an error of judgment in avoiding battle with a vastly superior fleet. Great public interest has recently been shown (1907) in the sentence of a company of negro troops to disbandment under martial law by President Roosevelt. In a court-martial the prisoner at present has much the same privileges of having an advocate, a right to reply, etc. as in the ordinary criminal courts. The judges are of equal or superior rank to the prisoner.

Cousin (*kōō′zan′*), **Victor,** founder of a school of philosophy, was born at Paris, Nov. 28, 1792. After finishing his studies he was appointed professor at the Sorbonne. He early began to write, and one of his first books, his translation of Plato, met with immediate success. His lectures drew crowds; his ideas, for the most part, were new to his hearers, bold, clear and beautiful in style; he also had a wonderful power in bringing together facts of history and philosophy so as to throw light on each other. He also took part in politics, and was one of the leaders of thought in Paris. So when his friend Guizot, in 1830, became prime minister, Cousin was made a member of the council of public instruction and also a peer of France. He also held other offices, and was a public man until 1849. His teachings have had great influence in Germany, England and America as well as in France. Among the best-known of his books are *The True, the Beautiful and the Good* and *The History of Philosophy.* He died at Cannes, France, Jan. 13, 1867.

Covenanters, a body of the Scottish people, including the greater part of the nation, who during the 16th and the 17th centuries bound themselves by *Covenants*

to make and keep the Presbyterian church as the only religion of Scotland. The first was drawn up by John Craig in 1581 and signed by James I. Others like it followed, and in 1638 was drawn up the Solemn League and Covenant, a bond between those opposed to the Catholic and Episcopal churches in Scotland, England and Ireland. It was adopted by the English Parliament. But in Charles II's reign, the covenant-oaths were declared unlawful and, later, treasonable; yet many of the Covenanters kept on taking these oaths until the Revolution of 1688 made it no longer necessary for the Scots to band together for the liberty of their church.

Cov'entry (*kŭv'en-trĭ*), a city of Warwickshire, England, about the middle of the kingdom, between the four English ports, London, Bristol, Liverpool and Hull. Its chief manufactures are ribbons, watches, bicycles and cloth. St. Michael's Church, built between the years 1230 and 1395, is the largest parish-church in England, its spire 200 feet in height. St. Mary's Hall, built in the 14th century, with its carved-oak roof and large painted window, is a fine example of ornamental work. In 1043 Earl Leofric and his wife, Lady Godiva, founded here a monastery. In Tennyson's *Godiva* is told the story of this lady's famous ride, clothed only by her long hair, through the streets of Coventry, while the people reverently kept within their houses behind closed blinds. This was the barbarous condition made by her husband, the lord of the town, when she pleaded that the citizens might be freed from harsh taxes. In memory of her there used to be splendid processions in Coventry. Here also Richard II stopped the trial by battle between the Dukes of Norfolk and Hereford, of which Shakespeare has so well told us in his *Richard II*. Here for a time Mary, Queen of Scots was imprisoned, and near the town was one of George Eliot's homes. Population 69,978.

Cov'erdale, Miles, editor of English versions of the Bible, was born in Yorkshire, England, in 1488. He studied at Cambridge, became a priest, and soon left the country. His edition of Tindale's and other men's translations of the Bible came out in 1535. The Psalms of this translation are still used in the Book of Common Prayer, and many of the most beautiful phrases in the famous King James' version are due to Coverdale. It was printed in German black-letter, in double columns, with wood-cuts. In 1538 Cromwell sent him to Paris to take charge of another translation, but the work was stopped and many of the sheets burned. However, the presses and type were smuggled into England, and the translation was brought out; it is known as the Great Bible. Coverdale was also editor of Cranmer's Bible. He was made bishop of Exeter, but was forced to leave England when Mary I came to the throne. He died in 1568.

Coverly, Sir Roger de, a fictitious character in Addison's paper, *The Spectator*, who has charmed lovers of literature for two centuries.

Covington (*kŭv'ĭng-tŭn*), the capital of Kenton County, northern Kentucky, on the Ohio River, opposite Cincinnati, to which it is joined by two fine suspension-bridges. Many of its people are Cincinnati business men; but it is more than a mere suburb of that city, having large distilleries and manufactures of glassware, nails and tobacco. It also has large industries in rolling-mills and in the manufacture of stoves, etc. The Licking River separates it from Newport, Ky. Covington is the seat of a Roman Catholic bishopric, and possesses good schools, churches, a hospital, orphan-asylum and public library. Population 53 270.

Cowbird, a bird found in fields feeding near cattle, picking up the insects the animals disturb in their grazing. It sometimes rides on the back of a cow, and often may be seen just in front of one. It makes no nest, but, like the European cuckoos, lays its eggs in the nests of other birds—usually in the nest of a smaller bird. The young cowbird is larger than the other nestlings, but the deception does not seem to be noticed by the foster-mother. The male cowbird is glossy, greenish-black, with head and neck dark coffee-brown. The female is dirty brownish-gray, with whitish throat. They live in small flocks.

COWBIRD

Cowboy. See RANCHING.

Cow'ley, Abraham, an English poet, was born at London in 1618. His father died before his birth, and it was through his mother's struggles that he got a university education. It was by reading a copy of Spenser's *Faerie Queene*, when hardly more than a child, that he came to write poetry. When ten years old, he wrote good verses, and brought out a book of poems when 15. On the breaking out of the Civil War, he followed the queen in her flight to Paris, and wrote letters in cipher for her to King Charles. Cowley's best known works are *Pindarique Odes* and *The Mistress*. During his lifetime he was held to be the greatest of English poets, but now he is little read. This is probably because he wrote for the court and for the taste of the people of his own time. Nevertheless, some few passages of his are powerful. He also

wrote essays, which are much better known than his poetry and rank with those of Goldsmith and Addison. He died on July 28, 1667.

Cow-Peas, a very important leguminous crop for forage and for adding fertility to the soil. They can be grown on soil too poor to support clover. (See NITROGEN-GATHERING CROPS). Its hay yields more dry matter and digestible protein than clover. (See BALANCED RATION.) Being susceptible to frost, the cultivation of most varieties is confined to the southern states. The soy-bean is another leguminous plant much grown for similar purposes. The seeds of both form a valuable concentrated food.

Cow'pens, a village of South Carolina, near which the British under Colonel Tarleton were defeated by the Americans under General Morgan, Jan. 17, 1781. Cornwallis dispatched Tarleton with 1,100 choice troops to drive Morgan into North Carolina. The forces met in an open wood known as Hannah's Cowpens. The Americans, who numbered about 1,000, were drawn up in two lines, with an advance corps of riflemen and a small cavalry reserve. The British charged, driving the riflemen back to the first line, when within bayonet thrust, the first line fell back on the second. A misunderstood order threw the Americans into confusion, and Morgan ordered a retreat to a slight rise where the cavalry were posted. On came the British, but just then the dragoons charged, and at the same time the rear line faced about, poured in a volley at close range, and charged bayonets. The British line was broken and put to flight. The British loss was 800 or 900; the Americans lost 72.

Cowper (*kōō'pĕr* or *kou'pĕr*), **William,** a celebrated English poet, was born in 1731 in Hertfordshire, England. When very young he was sent to Westminster School, where, he complains afterward, "he learned the infernal art of lying." One of his school-fellows was Thurlow, who jokingly promised him an appointment when he should be lord-chancellor, but failed to keep the promise. Cowper studied law and was offered by a cousin a clerkship in the house of lords. But the candidate would have to appear before the bar of the house, and this thought unmanned the poet. A fixed idea that every one was his enemy, the forerunner of madness, took possession of him. He tried to kill himself on several occasions, and for a time was confined in an asylum. After recovering his health, he met his good angel, Mrs. Unwin, in whose family, at Olney, he lived for some time; but his madness burst out again suddenly while he was making a call at the house of his friend, John Newton. He stayed there a year, refusing to go back to his own house, though it was but next door. In 1779, though he never fully recovered, began the brightest period of his life. As yet he had not written a line, but he followed Mrs. Unwin's counsels like a child, and when, to occupy his mind, she asked him to write poetry, poetry he wrote. He had also made the acquaintance of Lady Austen, another angel whose smiles put life into his brain, and her playful request that he write her a poem on something or other, "this sofa, for instance," resulted in *The Task*, Cowper's greatest work. One morning he also read her the famous ballad *John Gilpin*, the story of which she had told him the night before. In 1787 came on another attack of his old trouble, and again he made an attempt upon his life. Yet in these last gloomy years he wrote two of his most beautiful poems, one *Addressed to My Mother's Picture* and another to *My Mary*. See his biography, by Prof. Goldwin Smith, in the English Men of Letters Series. He died on April 25, 1800. Mrs. Browning was inspired by the pathos of his life to write one of her most poignant and appealing poems.

Cow'slip, a common native flower of English pastures, to be met with also in many other parts of Europe. It is a delicate, modest little flower, a great favorite both for its beauty and fragrance. It differs from the common primrose, in having umbels or spreading flower-clusters. These clusters or bells were long thought to be the haunts of fairies, and are still sometimes called fairy-cups. The flower commonly called Cowslip in America is a quite different blossom, a member of the Crowfoot family. It also is known as the Marsh Marigold, but is neither true Marigold nor true Cowslip. In appearance it closely

COWSLIP

resembles the buttercup. By whatever name called, the yellow of the blossom is purest gold, the glossy leaves are of richest green, the familiar cowslip a gladsome blossom of the spring. It grows in marshes, often quite deep in water, and is found north of Carolina and west to the Rocky Mountains. Its stem is hollow, its branches bearing both leaves and flowers. The upper leaves grow on very short stems, thereby not shading the lower leaves, all spreading out broadly to the light. The young plants are sometimes used for "greens." The season of flowering is quite long, from April to June.

Cox, Sir George William, an English cleric and historian, was born in 1827, and educated at Rugby and at Trinity College, Oxford. He held several curacies, and became rector of Scrayingham in Yorkshire. He wrote largely on Grecian history and mythology. His chief works are *A Manual of Mythology; Mythology of the Aryan Nations;* a *History of Greece; Introduction to the Science of Comparative Mythology and Folk-Lore;* and a *Life of Bishop Colenso.* With Dr. Brande he edited a *Dictionary of Science and Literature.* His death occurred in 1902.

Cox, Jacob Dolson, an American soldier and statesman, was born at Montreal, Oct. 27, 1828. He studied law and began practice in Warren, O. He was a member of the state senate when the Civil War began in 1861, and also was a brigadier-general of militia. He at once entered the Federal army and rendered conspicuous service throughout the war, taking part in many of the important battles and advancing to the rank of major-general. He was elected governor of Ohio, in 1866; was secretary of the interior in President Grant's cabinet in 1869; member of Congress from 1877 to 1879; and in 1885 became president of Cincinnati University. General Cox's qualities as a student and scholar, as well as a brave and capable general, gave value to his contributions to history of the great struggle, which include *Atlanta* (1882); *The March to the Sea* (1882); and *Military Reminiscences,* the latter being published after his death (Aug. 4, 1900).

Cox, Kenyon, American painter, was born at Warren, O., Oct. 27, 1856, and studied art in Cincinnati, Philadelphia and Paris. In the latter city he was a pupil of Gérôme In 1882 he became a member of the Society of American Artists, and settled in New York to pursue his profession. His pictures are chiefly portraits and figure-pieces, together with designs for book-illustration. Among the latter is his work done on Rossetti's *The Blessed Damozel;* he has also painted decorations in the Library of Congress and Bowdoin College. He died in 1919.

Cox, Palmer, American artist and author, was born at Granby, Quebec, April 28, 1840, and was educated at the academy of his native town. In early manhood he drifted to California, where he developed his native taste for drawing and sketching, while at the same time contributing to periodicals. He afterward returned east and settled in New York, where he contributed and illustrated a series of popular papers for the young, later published as *The Brownie Stories, The Brownies at Home, The Brownies through the Union, The Brownies in Fairyland,* etc. He also issued *Queer People with Claws and Paws; How Columbus Found America,* etc.

Cox, Samuel Sullivan, American politician and diplomat, was born at Zanesville, O., in 1824, and died at New York on Sept. 10, 1889. After graduating at Brown University he became editor of *The Statesman,* a Columbus, Ohio, journal, in which appeared a flowery description of a sunset, which earned him the sobriquet of Sunset Cox. For over 30 years he was a member of Congress, where his humor and debating power earned him influence. In 1885-86 he was United States minister to Turkey. He was the author of several works, among which are *A Buckeye Abroad; Eight Years in Congress; Why We Laugh;* and *Three Decades of Federal Legislation.*

Coyote (*kī-ōt'* or *kī-ō'tē*). See WOLF.

Crab, a short-tailed relative of the lobster and fresh-water crayfish. The lobster and crayfish each have a long tail, and so has the crab during its early life; the reduction of the tail is a case of modification. The crab is the highest member of the class of animals (*Crustacea*) which contains the shrimps, prawns, lobsters and crayfish. It has five pairs of legs and on this account is often called a *Decapod* or ten-footed animal. The first pair of legs ends in large claws, somewhat like those of the lobster, but smaller; the other four pairs are walking legs. The head-end is covered by a broadly expanded buckler or

CRAB

shield. (See illustration.) This is an outgrowth of the horney covering of the body,

and it covers the segments or rings of the body that are closely crowded under it, and serves to conceal the fact that the entire body of the crab is really composed of a number of segments. Those in the tail, or abdomen, are clearly separate joints, but those in front are much modified, crowded together, and covered by the before-mentioned buckler. This is technically named the carapace. It serves also to cover two gill-chambers on each side of the body. The gills are feather-like expansions of a membrane that is richly provided with blood-vessels. Within each gill-chamber is a water-scoop, the movement of which throws the water out in front and keeps a current of water running over the gills. On the head are short antennæ and eyes on stalks; the stalks are short in the common crab, but in some of its relatives are of considerable length. The horny outer covering is the same kind of substance (chitin) that forms the wing-covers and hard parts of insects, but in the case of the crabs it also contains a limy or earthy substance. As the animals grow, the outer covering becomes too small, and moulting is necessary. The hard shell is cracked and thrown off, through great exertions on the part of the animal. The moulting process takes away, also, the lining of the mouth and stomach and the outer covering of the eyes. The deserted shells are often to be picked up. The new shell is at first thin and flexible; it begins to form under the old one before the latter is cast off. Directly after moulting, while the shell is still soft, the animals are shy and conceal themselves. The eggs of the common sea-crabs are attached, underneath the tail, to the swimming appendages, and the young hatch there. The young of the crabs pass through several stages after hatching, before they come to look like their parents. In all of these early stages they have long tails, and, in one of them, they resemble the lobster. There are many varieties of crabs: The fiddler-crab has one large claw and one small one; the large claw is held in such a manner as to suggest a violin, and the small one in such a position as to represent

FIDDLER-CRAB

the bow. The spider-crab resembles in a general way a large spider. Some are good swimmers and others live upon the land. Some kinds are eaten. The largest known crab is a marine form of Japan, which is 22 inches between the biting claws. Some of the land-crabs are swift runners and live in holes. In the island of Ceylon one of the latter catches young birds, and even young rabbits are drawn by them from their holes and eaten.

Crabbe (*krăb*), **George,** an English poet, was born on Christmas Eve, 1754, at Aldeburgh, England. He served as a surgeon's apprentice, where he had to help the plowboy, and also picked up a little surgery at odd hours while working in his uncle's warehouse in London. But after a three years' struggling practice at home, he went to London with $15 in his pocket to try his fortune as a writer. He fought poverty bravely, having at times of stress to pawn his clothes and surgical instruments. At last, threatened with arrest for debt, he timidly left a letter at Burke's door and paced Westminster bridge all night till daybreak. But the great Burke was generous, and from that hour Crabbe was a made man. He became a clergyman and a busy writer. *The Village*, *The Parish Register* and *Tales of the Hall* are some of his poems. Many he never published, but burned yearly in a grand bonfire. Jane Austen is stated to have said that the poet was the only man she would care to marry. Byron, Wordsworth, Scott, Jeffrey, Cardinal Newman and other writers have praised his life-like painting of the scenery, fisherfolk and peasantry of his neighborhood. He died on Feb. 3, 1832.

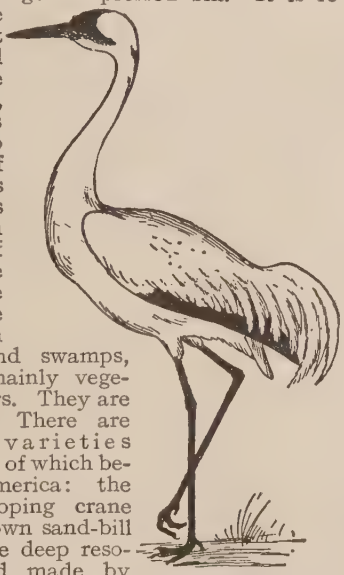
Craigie, Mrs. Pearl Mary ("John Oliver Hobbes"), Anglo-American novelist, was born at Boston, Mass., Nov. 3, 1867, and was the daughter of J. Morgan Richards. She was privately educated, and studied music in Paris and the classics at University College, London. In 1887 she married Reginald Walpole Craigie, and after a separation obtained a divorce in 1895 and the custody of her child. Meanwhile she had been received into the Roman communion. Her literary career began in 1891 with the publication of *Some Emotions and a Moral*, which was followed by *The Sinner's Comedy*, *A Study in Temptations* and *The Gods, Some Mortals and Lord Wickenham*. In these clever stories she showed herself a brilliant writer and a master of epigram. Her later work, besides the novel, *The School for Saints*, consisted chiefly of plays, of which the most successful was *The Ambassador* and a drama entitled *Repentance*. She died on Aug. 13, 1906.

Craik (*krāk*), **Mrs. Dinah Maria Mulock,** was born at Stoke-upon-Trent in 1826. When but a girl she supported her invalid mother and ten younger brothers by writing stories for fashion-magazines. In 1849 her first novel, *The Ogilvies*, came out, and she afterward brought out some 50

works—novels, poetry and essays. Her fame rests chiefly on *John Halifax, Gentleman*, published in 1857, one of the most popular books of the century, and translated into French, German, Italian, Greek and Russian. She died in Kent in 1887.

Cran'berry, the general name of the trailing species of *Vaccinum*, a genus belonging to the heath family. In North America there are two species of true cranberry, the small (*V. oxycoccus*) and the large (*V. macrocarpon*). They grow in swamps, and the red berries, ripening late, are familiar in the markets. The large cranberry is more extensively cultivated in the United States, the three centers of cultivation being Cape Cod, New Jersey and Wisconsin.

Crane, a large, long-legged bird with long neck and large compressed bill. It is related to the rail and not far removed from the herons, though it is wrong to call any of the herons a crane as is done in the case of the blue heron. The cranes live mostly in marshes and swamps, and are mainly vegetable feeders. They are migratory. There are about 17 varieties known, two of which belong to America: the white whooping crane and the brown sand-bill crane. The deep resonant sound made by the whooping crane is produced by a coil of the windpipe, in the breastbone. The windpipe of this species is four or five feet long, and 28 inches of it are coiled in the front part of the breastbone.



WHOOPING CRANE

Crane, in mechanics, steam-driven or run by electricity, used for hoisting girders, large stones or other heavy weights, and depositing such on trucks to be moved elsewhere. Traveling cranes are in use also on docks and wharves, where they load and unload machinery, general cargo and heavy merchandize from ship's holds, and also raise anchors and perform similar services. The common type of crane consists of an upright post or revolving shaft, with a projecting jib or arm, at the upper end of which is a fixed pulley, with winding gear, and the windlass on which the tackling is wound. Cranes are commonly constructed of cast-iron and steel, and are fitted with brakes and stopping gear, like other hoisting machinery. Other varieties in ordinary use include derrick, pillar, bridge, walking, traveling and locomotive-cranes severally in use for specific purposes.

Crane, Stephen, American author, journalist and war-correspondent, was born at Newark, N. J., Nov. 1, 1871, and died near Baden, Germany, June 5, 1900. He began newspaper work at the age of 17, and was a correspondent for the *Westminster Gazette* and the N. Y. *Journal* in the Greco-Turkish and the Spanish-American war. He shortened his life, however, by overwork, for between 1892 and 1900 he produced some 14 works in fiction, besides his labors as a war-correspondent. His style is wonderfully graphic and powerful. His best-known works are *The Red Badge of Courage; The Black Riders* and *The Eternal Patience.*

STEPHEN CRANE

Crane, Walter, English decorative artist and painter, was born at Liverpool, England, Aug. 15, 1845, studied under W. G. Linton, the eminent wood-engraver, and was appointed on the committee of the general exhibition of water-color drawings in 1879. He was a knight-commander of the Order of the Royal Crown of Italy. He also for a time was member of the Institute of Painters in water-colors and oils, and was first president of the arts and crafts exhibition founded by him in 1888. He was perhaps most widely known by his work as a book-illustrator and designer of children's picture-books. The Walter Crane toy-books have found their way, it may be said, round the world. His chief canvases include *The Renaissance of Venus* and *The World's Conquerors.* In 1892 he issued *The Claims of Decorative Art;* in 1896 *The Decorative Illustration of Books;* and in 1898 *The Basis of Design.* He died March 15, 1915.

Cran'mer, Thomas, Archbishop of Canterbury, was born at Aslacton, England, July 2, 1489. As a boy he could ride the roughest horse in the shire, and was a keen hunter. He studied at Cambridge, gained a fellowship, and stayed 26 years. In the summer of 1529 he met two officers of Henry VIII, and, the talk turning on the king's divorce, Cranmer said that Henry could satisfy his conscience in that matter by appealing to the universities of Christen-

dom. This pleased Henry much; and the king asked: "Who is this Dr Cranmer? Marry, I trow, he has got the right sow by the ear." So Cranmer became royal chaplain, was sent on embassies to Italy and Germany, and made archbishop of Canterbury. The king found in Cranmer a pliable tool; the servant divorced the master from Catherine, Anne Boleyn and Anne of Cleves. He pleaded timidly in behalf of Anne Boleyn and on behalf also of Henry VIII's vicar-general, Thomas Cromwell; still, if Henry said they were guilty, guilty they were in Cranmer's eyes. Cranmer was instrumental in having the Bible translated, and drifted toward Protestantism. The dying Edward VI won him over to signing the paper that was to make Lady Jane Grey queen instead of Mary. Under Queen Mary the persecuting statutes against heretics were revived, and one of the chief men of the time to suffer was Cranmer, who was condemned for treason, then retried as a heretic. From Oxford gaol he saw the reformers Latimer and Ridley die at the stake, and panic-stricken wrote seven recantations, the last on the morning of March 21, 1556. At once he was taken to church, where he listened to a grim sermon in which he learned that he must burn; but when he was to read his recantation, he instead took back all he had said "from fear of death." He went to the stake cheerfully, and, thrusting his right hand into the flame, kept it there saying: "This hath offended; O this unworthy hand!" See Tennyson's *Queen Mary* for an appreciative view of Cranmer's character.

Cran'ston, Rhode Island, a town in Providence County, made up of several villages, with many attractive residences, on the New York, New Haven & Hartford Railroad, and on the western shore of Narraganset Bay about nine miles southwest of Providence. A state-prison, insane asylum, reform-schools, almshouse and workhouse have their seat here. The town was settled early in the 17th century, and incorporated in 1754. Besides its extensive cotton manufactures, it has wire-works, a large brewery and considerable market-gardening. Population, 25,201.

Crawfish or **Crayfish,** a fresh-water animal like the lobster, but of smaller size. The front part of the body is covered by a shield-like expansion of the outer shell. This takes in the head and what corresponds to the chest or thorax; it is an expanse of the horny covering of the body, which is made of chitin and hardened by deposits of lime therein. The expansion covers two gill-chambers—one on each side. There are from 18 to 20 pairs of feather-like gills, which are membranous and richly provided with blood-vessels. A gill-bailer lies in the front of each gill-chamber, the movement of which throws the water out of the chamber in little jets and keeps a current of water flowing over the gills. The crayfish is composed of a series of body-rings, but those in front are so crowded together and modified, that it is difficult, at first, to appreciate this fact. If the shield-like expanse (*carapace*) is removed, the furrows separating the segments can be seen. The tail (or abdomen) is composed of six similar rings, and each ring bears a pair of appendages—called in this position swimmerets. The fact that every ring bears one pair of appendages is the key to determining the number of segments in the entire body. If we count the appendages in that region covered by the carapace, we shall find, in all, 14 pairs, and, since each pair represents a ring or segment, we know that there are 14 segments

CRAWFISH

crowded together in the front end of the body. The 14 pairs of appendages are the eyes, the small and the large antennæ, the jaws, surrounded by five pairs of modified mouth-parts; and, finally, the five pairs of limbs. The first pair of these ends in large claws, and the next two pairs in small claws. The crayfishes live abundantly in streams, and often make holes in the bank. They are omnivorous eaters, dead fish, water-snails, tadpoles, frogs, larvæ of insects, vegetable matter in the water and the like being all devoured. The eggs are attached to the swimmerets, and, for some time after hatching, the young cling by their claws to the swimmerets of the mother. They moult or cast off the outer shell, including also the lining of the mouth and stomach, which is horny in nature. The processes of life in the crayfish duplicate those of higher animals, and Huxley showed how a study of the structure, development, distribution and physiology of this one animal introduces us to the general facts of zoology. See Huxley: *The Crayfish.* See CRAB.

Crawford, Francis Marion, cosmopolitan American novelist and son of a sculptor, was born at Bagni di Lucca, Italy, Aug. 2, 1854, and was educated partly in the United States and partly in Italy, and had a private tutor at Trinity College, Cambridge

England He afterward prosecuted his studies at Karlsruhe and at Heidelberg; studied Sanskrit at Rome; and in 1879 proceeded to India to edit a newspaper, *The Indian Herald*, at Allahabad. From 1881 to 1883 he was in America, but after that time for the most part resided at Sorrento in Italy. He published more than 40 novels, from *Mr. Isaacs* in 1882 to *The White Sister*, 1909. His fertility as an author was no less extraordinary than was the wonderful variety and rich interest of his romances. He was one of the most cultured of modern writers of fiction, and his novels, though rarely realistic and hardly ever dependent upon dialect, invariably interest and instruct. The following are others of his novels: *Saracinesca; Marzio's Crucifix*; *Sant' Ilario*; *Don Orsino; Casa Braccio; Zoroaster; A Rose of Yesterday; Corleone;* and *Ave Roma Immortalis*. He died April 9, 1909.

F MARION CRAWFORD

Crawford, Thomas, an American sculptor, was born at New York in 1814. In 1834 he went to Rome, where he worked under the guidance of Thorwaldsen, the great sculptor. His finest works are the *Washington Monument* at Richmond and the bronze statue of *Liberty* on the dome of the Capitol at Washington. He died at London on Oct. 16, 1857.

Crawfordsville, Ind., a city, the county-seat of Montgomery County, on the Cleve., Cin., Chic. & St. Louis, Vandalia and Monon railways and T. H., I. & E. traction line, 43 miles northwest of Indianapolis. Platted in 1823, it was incorporated as a city in 1865. It is the seat of Wabash College (Presb.), and is famous for the number of distinguished writers it has produced. Its manufactures consist of wire-fence works, wagon, spoke and curb factories and foundry-products, in addition to lumber-mills, carriage-works, etc. Population, 9,371.

Crayfish. See CRAWFISH.

Creamery, a dairy-factory enterprise for making butter, cheese and condensed milk, familiar in the chief eastern and middle-western states of the Union in the past 20 years. They are conducted usually by stock or co-operative companies, or by private individuals having experienced and skilled men to conduct and manage them. Recent returns show that close upon 6,000 creameries are in operation over the country; and in the best of them, which now produce a high-grade output, they confine themselves either to butter or to cheese-making, rarely making both in one factory. The states which today have the largest number of creameries are New York, Pennsylvania, Wisconsin, Illinois and Minnesota, their seat being in the principal dairy-regions. When the milk is delivered by the farmer to the factory, it is weighed, tested as to quality, and its value credited to the owner-producer; the cream is then separated by power (if it has not previously been separated before being brought to the factory), the farmer usually receiving the skim-milk for feeding. The more general plan followed to-day by the producer is to use the local separator-factory or skimming-station, only the cream being taken to the creamery, thus reducing the cost and trouble of hauling.

Cream-Separator, a machine for taking cream from milk, which depends on the physical principle that the heavier a whirling body is, the greater its tendency to fly from the center. The milk is passed into a vessel revolving at a high rate of speed on its own center. The cream, composed largely of butter-fat, being lighter, stays in the center and escapes by a tube. The heavier skim-milk, flying to the outer sides of the vessel, escapes through perforations into an outer jacket and is carried away by another tube. The machine can be adjusted to separate cream of any desired thickness between certain limits. This thickness can be accurately measured in terms of percentage of butter-fat. 98% of butter-fat can be thus separated as against 75% by the old-fashioned shallow-pan skimming, or 85% by the better deep-setting method, in which cans about 20 inches deep are set in cold water over night and the skim-milk drawn off from below by a faucet. The separator has the advantage of acting quickly, and so making it possible to market the cream with much shorter exposure to the air. Separators will handle from a few pounds of milk per hour up to 4,000 pounds. The smaller ones are usually operated by hand-power. The separator works best at a temperature of between 85 and 100 degrees Fahr Separator-cream is much purer than that obtained by the gravity-methods, because the impurities, being heavy, fly from the center along with the skim-milk. The separator has made possible the rapid growth of creameries as an organized industry, there being over 5,000 in United States in 1905. These can make butter more economically and of more uniform grade than can be done on the farms. Hand-separators enable the owner of a small number of cows to handle less bulk than he would in hauling milk to a creamery. See, also, BABCOCK TEST.

Creation, The, an oratorio by Joseph Haydn, composed during the years 1796-8. The words are selected from *Genesis* and Milton's *Paradise Lost*, with modifications by Baron von Swieten. The oratorio was first produced at Vienna, April 29, 1798, and ranked next to *The Messiah* in popularity until the appearance of Mendelssohn's *Elijah*.

Haydn placed a higher estimate upon *The Creation* than he did upon his second oratorio, *The Seasons*, written during 1798-1800.

Crécy (*krā'sē'*), a town of France, where, on Aug. 26, 1346, Edward III of England, with about 30,000 men, won a brilliant victory over 100,000 French under the Count of Alençon. The flower of French chivalry, together with the blind king of Bohemia, who was fighting on the side of France fell in this battle. In all, fully 30,000 French bit the dust. Here the Black Prince gained his spurs and adopted the threefold feather-crest of the fallen Bohemian king, with the motto *Ich dien* (I serve), still worn by the Princes of Wales. The battle was one of the earliest in which cannon were used by the English.

Creeks, an Indian tribe, living, when first seen by De Soto in 1540, on the Flint, Chattahoochee, Coosa and Alabama Rivers in Florida. Their own account of themselves is that they came out of the earth and marched from the northwest to the lands then held by them. From their language, they probably are of the same race as the Choctaws and Chickasaws. Their alliance was courted by the Spaniards in Florida, by the French in Louisiana and by the English in Carolina. During the Revolutionary War they attacked Wayne's army, and at its close many Tories joined them. Washington got some of their chiefs to come to New York and sign a treaty; but they continued still hostile. In the War of 1812 they surprised Fort Mimms, killing 400 men, women and children. They were at once attacked by United States troops and defeated seven times, the last time being utterly crushed by General Jackson at Horseshoe Bend. When hopeless, having lost 2,000 warriors, their country ravaged and their towns laid in ashes, they submitted. Nevertheless, the government treated with them for years before it succeeded in getting them across the Mississippi. One chief, General William McIntosh, who signed a treaty in 1825, was put to death by his enraged countrymen. But when, in 1836, some of the Creeks had attacked the frontier towns of Georgia and Alabama and had been defeated by General Scott, about 25,000, who were still left on their old grounds, were at once sent to join the rest of their nation, between the Arkansas and Canadian Rivers. In the Civil War some joined the north and some the south. Schools and churches were late in obtaining a footing with the Creeks, as their only idea of Christianity was what they learned from the negroes, and the proud warriors would have nothing to do with the slaves' religion. Their government was peculiar. Each town had nothing to do with the others, but was ruled by its own *micco* or king, who was chosen as a ruler. Next to him was the war-chief. Every town had a square in its center, shut in by houses, the *micco* and war-chief having special houses. On this square was held their great feast.

Creeper, Brown, a little, brown, mottled bird that creeps—or rather flashes—round and round a tree in search of larvæ. It is our one member of the family of Creepers. It is a little smaller than the English sparrow; is grayish-white beneath; the brown and gray above very like in coloring

BROWN CREEPER

to the bark of a tree; it has a slender, curving bill. It is a most diligent bird; it starts from the bottom of a tree and in a sort of spiral climb picks out with utmost care the larvæ in the bark. In climbing it sometimes uses its tail like the woodpecker, the tail being stiff and sharp at the points. The breeding-range is in the northern states and northward; from September to April it may be found from Massachusetts to Florida.

Cre'ole. See NEW ORLEANS.

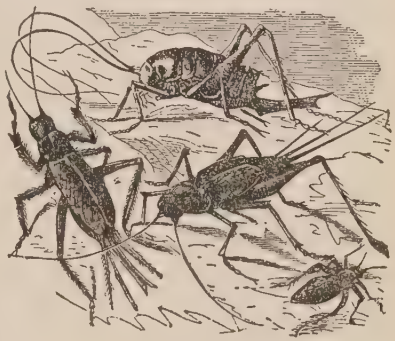
Cress, name of various plants whose leaves are an agreeable relish, much favored in salads. Garden-cress often called peppergrass, is gaining ground in American gardens. In winter it may be grown in flower-pots or boxes, the seed sprouting very quickly; for a supply of tender leaves seed should be sown very frequently. Water-cress is an important market-crop. It can be grown in almost any pool or shallow water course with sand or gravel bottom, being introduced by scattering seeds or some freshly cut branches. It is a hardy perennial.

Creston, Iowa, a city, the seat of Union County, in the south of the state, on the Chic., Burl. and Quincy Railroad, 60 miles southwest of Des Moines. Besides its shipment of live-stock it has extensive railway-car works, machine-shops and wagon-factories. The city, which was settled so recently as 1868, is growing rapidly, and it has a fair showing of public buildings, besides schools and churches. Population 7,852.

Crete (*krēt*), a Turkish island in the Mediterranean. It is the southernmost portion of Europe, 160 miles in length and from 7 to 35 broad. The climate is fine, and the air fresh and bracing. Crete is quite mountainous, and its highest peak, Mount Ida, is 8,060 feet above the level of the sea. There are many harbors on the island: Suda Bay on the north is one of the best in the Mediterranean; and Fair Havens, in the south, is spoken of in *Acts*. Wheat and fruit, especially oranges and lemons, are mainly raised Olive-oil, soap, nuts and the like are exported. Sponges are found on the coast. There are a few wild animals, but not a snake on the island. There are now only three towns of any size, though Vergil told of its "hundred cities." During the past quarter-century the remains of a great civilization have been discovered that equalled those of Egypt and Babylonia, and dates back 2,000 if not 3,000 years before Christ Crete is now an autonomous Greek province, under Turkish suzerainty, though paying no taxes to Turkey; and its viceroy is always a native Greek Christian. The early Cretans were seafaring Greeks, the rivals of the Phœnicians. Its laws and its great lawgiver, Minos, were famous, as were also its bowmen; while a Cretan came everywhere to mean a liar. Rome, the Saracens, the Greek emperors, Venice and the Turks have in their day owned the island. Its area is 3,365 square miles; and its population is estimated at 310,815. Canea is the capital (population, 24.537).

Crichton (*krī'tŭn*), **James,** called the Admirable Crichton was born Aug. 19, 1560, in Perthshire Scotland, and was educated at St. Andrews. After leaving the university he went to France. His swordplay and power as a debater on any subject with the professors of the Sorbonne are said to have astonished all Paris. At Venice the great printer Aldus was his friend. Here he spoke before the doge and senate, and is said to have astounded them with his eloquence and grace. Other encounters took place, in which, it is said, he made Latin poems on the spot, offered to carry on the debate in poetry, and performed like prodigies. Moreover, according to the story, he became tutor to the heir of the duke of Mantua. Here he killed a skillful duelist, and became so renowned that he was attacked one night by three masked men out of jealousy. Crichton's swordsmanship gave him the best of it, and to save his life the leader of the masks was forced to tell who he was. It was Crichton's prince-pupil. The tutor fell on his knee, and, presenting his sword, asked his pardon; but the prince basely ran him through the body. Crichton had a fine memory, is said to have been familiar with 12 languages, and was a good debater, but many of the stories of his prowess are probably fictitious. He perhaps fell in a night-brawl, but that it was his own pupil who dispatched him is unlikely. He died at Mantua, in 1583, or, according to others, some time between 1585 and 1591.

Cricket, an insect related to grasshoppers and locusts. There are three kinds—mole-crickets, true crickets and tree-crickets The mole-crickets have their front limbs expanded and especially fitted for digging; they make burrows and lay their eggs in underground chambers. The true crickets are very abundant in the fields; they are black, sometimes with brownish wings They usually feed on plants and lay their eggs in the ground in the autumn, the broods hatching out in the spring. To this division



CRICKETS

belong, also, the house-crickets. The chirping sound is produced by the males rubbing the file-like edges of the principal vein of their wing-covers upon a scraper located on the margin of the opposite wing-cover The true wings are not involved in making the sound. The tree-crickets are delicate, whitish-green They live on trees and shrubs, and often do damage by boring to deposit their eggs. One kind lays its eggs in stems of the raspberry The katydid is not a cricket.

Cricket (*krĭk-ĕt*), the Englishman's national game the world over, is an outdoor game with balls, bats and wickets. It is played by 11 men on a side. Two wickets, each consisting of three uprights or stumps rising 27 inches above the ground and with two small pieces or bails on top of the uprights, are placed opposite each other, 22 yards apart. One eleven takes position in the field, the other goes to bat. The bowler of the first eleven stands almost behind one wicket, the wicket-keeper directly behind the other. Two players from the second eleven stand at the wickets, the first batsman in front of one, the second beside the other The bowler rolls his ball at the opposite wicket, to knock it down or make the batter hit

the ball so that it will be caught on the fly and the batsman put out. The batter prevents the wicket from being hit, drives the ball far enough to give time for changing places with the other batter, and so makes runs. These continue so long as there is no risk of the stumps being hit while the batsmen are away from the wickets. If, however, the batter let the ball carry a bail or a stump away; or knock either down himself; or stop the ball with his body; or has the ball caught in the air—he is out. After five balls have been bowled, (sometimes four or six by arrangement), the eleven in the field changes to the same positions for the second wicket that it had for the first. Bowling at the second wicket continues for five balls, but by another bowler, and so it goes until ten men have batted. The eleventh is not out. This makes an inning, but, as a large number of runs may be made by a single batsman, it usually lasts more than a day. Then the other eleven comes to bat, and the first goes to the field. Two whole days at least are required for a first-class two-innings match. The game generally ends with a fourth inning, the eleven with the most runs being the winner. The rules of the Marylebone club (founded 1744) govern the game everywhere.

Cricket on the Hearth, The, is one of Dickens' Christmas-Books, and like the others is characterized by a whimsical, almost fantastic humor, while it presents in the most edifying fashion the contrast between greed, selfishness and cunning on the one hand and simple goodness of heart on the other. It is distinguished by a truly dramatic climax. A good husband, believing that his young wife loves another and blaming himself for the loss of her affection, is about to sacrifice his home for her sake, when, to the reader's great relief, the burden of sorrow is suddenly transferred to a despicable old fellow, who had hoped to win a pretty young bride by the power of his money. He loses his bride, but is so moved by the unselfish love of all around him that his own heart is renewed, and he joins happily in the marriage-festivities. The merry chirping of a cricket mingles with the song of the kettle to soften with its music the passions that at times threaten to destroy the peace of home.

Crime'a (the ancient *Chersonesus Taurica*), a peninsula of southern Russia, between the Black Sea and the Sea of Azov. It is about 125 miles from north to south and 200 from east to west, and has an area of about 10,000 square miles. It is joined to the mainland by the isthmus of Perekop. Balaklava and Sebastopol are its two chief harbors. The Crimea was once famous for its wheat, but of recent years the peninsula has suffered much from drought. Porphyry and coal are found. The Crimea's situation in the Black Sea, between Europe and Asia, has made it a tempting prize alike to Greek, Tartar, Turk and Russian.

The Crimean War (1853–56), fought in the peninsula, was caused by Russia's attempt to establish its protection and that of the Greek church over the Christian subjects of Turkey, who, like the Russians, are of the Greek church. Turkey was aided by France, England and Sardinia. The battles of the Alma, Tchernaya, Balaklava and Inkerman were fought, and the fall of the strongest fortress of the Russians, Sebastopol, brought an end to the war. By the treaty of peace Russia gave up all she had gained during the war. Population of the Crimea about 250,000 (80,000 Tartars, 130,000 Russians, 40,000 Greeks, Jews, Bulgarians and Germans).

Cripple Creek, Col., a mining town, situated on the foothills of Pike's Peak, in El Paso County, Colorado. Gold was discovered in its vicinity about 1885, but it was not until 1891 or later that its rich mining-wealth attracted experts and the town began to develop. Its annual production of gold is estimated at about $10,000,000. The town in 1894 was the scene of a miner's strike, and in 1896 it was visited by a destructive fire; but in spite of these drawbacks it has grown apace. Population, 6,206.

Crisp, Charles Frederick, an American politician, and speaker of 52d and 53d Congress, was born at Sheffield, England, Jan. 29, 1845; and died at Atlanta, Ga., Oct. 23, 1896. In early life he settled with his parents in Georgia, and in 1861 entered the Confederate service, in which he rose to the rank of lieutenant and was captured by the Federal forces. After the war he studied law, and in 1872 was elected attorney-general of a judicial district of Georgia, and subsequently became judge of the superior court of the state. In 1882 he was returned as a member of Congress, and in 1892 and 1893 was speaker of the house. In politics he was a Democrat.

CHARLES F. CRISP

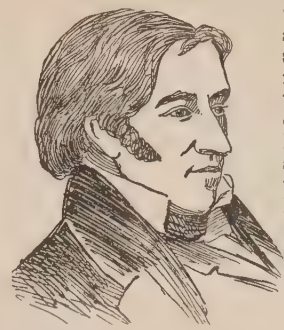
Crispi (*krēs'pē*), **Francesco,** an Italian statesman, was born Oct. 4, 1819, at Ribera, Sicily, and became a lawyer at Naples. In 1848 he was one of the heads of the rising at Palermo, and for two years a leader of the Sicilians against Ferdinand I. In 1859 and 1860 he acted with Garibaldi in driving out

the Bourbons from Sicily. In 1877 he became a member of the national cabinet, and afterward was premier of the Italy he had helped to make. Here he took high rank among the statesmen of Europe. It is due to Crispi that Italy entered the Triple Alliance with Germany and Austria; and the policy of keeping up the army on a footing with other European states of the first rank and of building up a war-navy was mainly his. He died at Naples, Aug. 11, 1901.

Crit'tenden, John Jordan, was born in Woodford County, Ky., Sept. 10, 1787. He graduated at William and Mary College, Virginia, studied law, and became famous as a criminal lawyer. He served many times in the Kentucky legislature, was six times chosen senator of the United States, and served one term as representative in Congress and one term as governor of Kentucky. He also was attorney-general under Presidents Harrison and Fillmore. He was most prominent just before and during the Civil War. He opposed the repeal of the Missouri Compromise; in the Kansas troubles he sided against the course of Presidents Pierce and Buchanan; when Lincoln was elected he took firm ground for the Union; and in 1860 he proposed amendments to the constitution which, he thought, would allay strife. He strenuously sought to keep Kentucky in the Union, but was unwilling that slaves should be used as soldiers. He remained in public life to the close of his career, being in the midst of a campaign for reelection to Congress when he died near Frankfort, Ky., July 26, 1863.

Crittenden, Thomas Leonidas, son of the above, an American general, was born in Kentucky in 1819, and died on Staten Island, N. Y., Oct. 23, 1893. After studying law he became attorney-general in Kentucky in 1842, and from 1849 to 1853 was United States consul at Liverpool, England. Previous to this, he had served under Taylor in the Mexican War, and on the breaking out of the Civil War he entered the Union army, and was promoted to the rank of major-general and given command of a division of the Army of the Tennessee. Later, he served under Buell and Rosecrans, and at Chickamauga commanded one of the two corps that were routed. Resigning his commission in 1864, he entered the regular army two years later as colonel of the 32d infantry, and was brevetted brigadier-general in 1867. In 1869 he was transferred to the command of the 17th infantry and served on the frontier till 1876, and was in command of Governor's Island until he retired in 1881.

Crock'ett, David, was born at Limestone, Tenn., Aug. 17, 1786. Davy, as he was always called, was sent to school, but on the fourth day he quarreled with the schoolmaster, and, in fear of a thrashing both from his father and from his teacher, he ran away from home, spending his time roaming about with drovers and carriers. When 18, he came home, and for the first time learned his letters. In 1813 he served in the Creek War under Jackson. After serving in the legislature, he was sent to Congress for three terms. But, though at first a follower of Jackson, he had now become opposed to him, and, foreseeing defeat, he thought of starting upon a new career in Texas, which was then in revolt against Mexico. He had all his life been noted as a crack shot, a great hunter and a brave fighter. Here also, in Texas, he became famous for his exploits. He met his death after defending Fort Alamo against a large Mexican force. When only six men were left, the fort was captured, and the six, including Crockett, were shot by order of Santa Anna, March 6, 1836.



DAVID CROCKETT

Crockett, Samuel Rutherford, Scottish novelist, was born at Duchrae, Galloway, Sept. 24, 1860; and was educated at Edinburgh, Heidelberg and Oxford for the Scottish Free-Church ministry, which he entered in 1886, but afterward abandoned for literature. For a time he held a traveling tutorship at Oxford, and this enabled him to see Europe, Asia and Africa. His stories, however, deal chiefly with the homely characters and scenes of his native land. Scottish peasant-life has hardly ever, since the days of Scott and Galt, had so realistic and delightful a portrayer and delineator. He, moreover, draws much of his inspiration from his love of Scotland and of Scottish romantic and religious history. His novels, *The Raiders* and *The Men of the Moss-Hags*, admirably recreate the era of the Covenanters and their martyrdom for their stern faith. The first novel to bring Mr. Crockett fame was *The Stickit Minister*, published in 1893. Since then he has issued, among other works, *Sweetheart Travelers*, *Cleg Kelly* and *The White Plume of Navarre*. He died in 1915.

Crocodile, a large, well-known water-reptile covered with bony scales. The tail is long and crested. The name is properly applied to a number of animals living in Asia, Africa, Australia and America. The crocodile of the Nile is the most famous. It occurs in nearly all the rivers of Africa. It is said that, owing to the persecutions

of travelers, it is greatly reduced in numbers in the lower Nile, but it still is very abundant above the first cataract. This reptile is ordinarily 12 or 13 feet long; exceptional sizes are 18 and 20 feet in length. It seizes cattle and antelopes by the nose while drinking, and draws them into the water. Crocodiles devour dogs when they can catch them, and occasionally a child falls victim to the crocodile, but they rarely attack adults. On the whole they seem to prefer putrid flesh. They leave the water to bask on the mud-banks of rivers and marshes, and here they lay their eggs. From 20 to 60 eggs are inclosed in holes in the sand or mud, and left to be hatched by the heat of the sun. Associated with the crocodile is a bird, called the Nile-bird, that enters the mouth of the reptile while it is held open, and picks the leeches from the tongue and walls of the mouth-cavity. The gavials of India with long slender snouts belong to the crocodile group. The American crocodiles, living principally in South America and the West Indies, are now occasionally captured in Central America and the marshes of southern Florida. See ALLIGATOR.

CROCODILE

Cro'cus. A genus of the iris family, some of which are the earliest spring-flowers, but some bloom in the fall. The genus contains about 70 recognized species, and is native to southern Europe and southwestern Asia. The grass-like leaves and long tubular showy flowers rise directly from a subterranean corm. Numerous varieties are in cultivation.

Crœsus (*krē'sŭs*), king of Lydia, in Asia Minor, came to the throne about 568 B. C., when he was about 35 years old. The Greek cities of Asia Minor fell before his armies. He became wealthier than any ruler whom the Greeks knew, and "as rich as Crœsus" became a common saying. Solon, the Greek sage, once visited him. The king displayed all his treasures, and then asked the wise Greek who was the happiest man he had ever known. "Tellus of Athens," was the answer; "for he lived while his country was prosperous; he was surrounded with children and children's children, who were both beautiful and good; and he died upon the field of battle after having gained a gallant victory over the enemy." "And further," said Solon, "no man can be fully happy until a happy death has closed a happy life." And, in truth, Crœsus' wealth did not save him from misfortune. A son of whom he was very fond was accidentally killed in a boar-hunt. News came, too, that the Persian Cyrus, who had conquered right and left, had cast a longing eye on Lydia. Not knowing what to do, Crœsus asked advice of the famous oracle of Delphi. Said the oracle: "If Crœsus goes to war, he will destroy a mighty empire." What could be plainer? So off goes Crœsus, to be badly whipped by Cyrus, and to find that the empire he was to destroy was his own. When Sardis, his capital, was stormed, the king, careless of life, was about to be slain, when another son, who had been born dumb, scared into speech, told the Persian soldiers that it was the king, and he was kept for a worse death. Placed on a huge funeral-pyre, he watched the flames licking their way upward to their victim, and, thinking of what Solon had said about a happy death, he kept crying out: "O Solon! Solon!" Cyrus chanced to hear him, and, asking what he meant, was told the sage's warning, which made such an impression on him that Crœsus was rescued from the pyre, and became the conqueror's friend and guardian of his son and heir, Cambyses.

Croly, Jane Cunningham, American writer, known better by her pen-name of Jennie June, was born in Leicestershire, England, in 1831, and settled with her family, ten years later, at Poughkeepsie, N. Y. In 1857 she married D. G. Croly, a journalist, who died in 1889. From 1860 to 1887 she was editor of *Demorest's Magazine*, founded the Sorosis society, and took part in progressive movements on behalf of women. Subsequently she was elected to the chair of literature and journalism in Rutgers College and president of the New York City Women's Press club. Her books consist of a *History of Sorosis* and of the woman's club movement in America; *Talks on Women's Topics; For Better or Worse; Thrown upon Her Own Resources*, etc. She died on Dec. 23, 1901.

Cromer, Evelyn Baring, first **Earl of,** was born in Cromer Hall, Norfolk, on Feb. 26, 1841, and educated at the Royal Military Academy at Woolwich. He entered the Royal Artillery in 1858, and became captain in 1870 and major in 1876. After service in the colonies he was made private secretary to Lord Northbrook, while he was viceroy of India, from 1872 to 1876. He was commissioner of the Egyptian public debt in 1877-9, controller-general in Egypt, 1879, financial member of council of governor-general of India, 1880, and minister plenipotentiary, agent and consul-general in Egypt, 1883-1906. He was created baron in 1892, viscount in 1898 and earl in 1901, and was a privy councillor and a member of many orders of merit. He wrote several military works, paraphrases and translations from the Greek and a history of his Egyptian proconsulship. He virtually was king of Egypt, and his work there was constructive statesmanship

of the highest order. Egypt under him almost became another land. He died in 1917.

Cromp'ton, Samuel, was born at Firwood, Lancashire, England, Dec. 3, 1753, of poor parents. He educated himself, at the same time working as a cotton-spinner and playing the violin at the theater in the next town. In 1779 his spinning-mule was finished, after five years' labor, working at it even late at night. It spun yarn so wonderfully fine that his house was beset by persons eager to know the secret. Ladders were placed at the windows, and in almost every way the inquisitive tried to see it. He could not leave the house for fear his discovery would be stolen. All his savings had gone into the machine, and he had not a farthing left to secure a patent. In his misery he made known the working of the invention to a few manufacturers; from some he never got a cent, and in all he received but a beggarly $300. He managed, however, to start in business with the aid of friends, at first employing his own family as hands; but he was 60 years old before he received any return, when Parliament granted him $25,000. His mule came into use at once, and in 1811 there were in England 4,600,000 of them. He died near Bolton, England, June 26, 1827.

Cromwell (*krŏm'wĕl*), **Oliver,** Lord-Protector of the English Commonwealth and one of the most remarkable characters in English history, was born at Huntingdon, England, April 25, 1599. Little is known of his early life, except that he went to Cambridge. He had, however, but a short time for study, his father dying soon after he entered college, and he returned home to manage the family affairs. In 1628 he entered Parliament. When all hope of a reconciliation between Charles I and Parliament failed, Cromwell was among the first to offer to aid the state in defending its rights. He moved in Parliament for permission to raise two companies of volunteers, having been careful to supply the necessary arms beforehand at his own cost. He soon showed his wonderful military genius. He commanded the right wing of the Parliamentary army at Naseby (June, 1645), where the king's forces were utterly routed. Charles, in May, 1646, escaped in disguise, and surrendered himself to the Scottish army at Newark, by whom he was handed to the commissioners of Parliament. In January, 1649, the king was tried, condemned and executed. Cromwell was a prominent member of the new council of state. He crushed the rebellion in Ireland and in Scotland, and soon became the leading man in England. He dissolved the Long Parliament in 1653, and summoned a new one. The work of this parliament, which was dissolved in five months, gave Cromwell supreme power and the title of lord-protector. Cromwell repeatedly called and dismissed parliaments because he wanted the people themselves to govern and also wanted his government to be strictly constitutional, but his government was just and liberal toward the people and the country prospered under his rule. He died at Whitehall London, Sept. 3, 1658.

Cronje (*krŏn'yĕ*), **Piet,** a Boer commander in the war with Britain (1899-1901), was born in South Africa about 1835. He was a member of the Transvaal executive council, under President Paul Kruger, and in the raid of Jameson and his Uitlanders, in January, 1896, he brought about their surrender. He defeated Lord Methuen at Magersfontein, but afterward surrendered to Lord Roberts at Paardeberg, and was sent to St. Helena as a prisoner of war, but was released on the cessation of hostilities.

Cronstadt (*krōn'stȧt*), a strongly fortified seaport of Russia, is situated on the island of Koblan, near the head of the Gulf of Finland and 20 miles west of St. Petersburg. The island separates the approach to St. Petersburg into two channels, only one of which is navigable. This is narrow and strongly guarded by batteries. There are seven granite forts armed with heavy guns, and during the Crimean War Cronstadt was held to be impregnable. There are three harbors: the merchant harbor, which will hold 1,000 ships; the middle harbor, used for fitting vessels; and the war harbor, the regular anchorage for the Baltic-fleet section of the Russian navy. A large number of the people are sailors or workmen in the dock-yards. Cronstadt was founded by Peter the Great. Population, 59,939.

Crook, George, an American general, was born Sept. 8, 1828, near Dayton, Ohio. He graduated at West Point in 1852, and served on the frontier till the breaking out of the Civil War, in which he served with distinction, commanding a corps of Sheridan's army at the battles of Winchester, Opequan Creek and Cedar Creek. After the war he commanded in the west, becoming brigadier-general in 1873. His campaigns against the Pi Utes in 1872 and the Apaches in 1875 were ably fought. In 1882 he drove the Mormons and squatters from Indian lands, and brought the hostile Chiricahuas to terms. He was also concerned for the welfare of his Indian charges, among other reforms forcing the contractors to pay the Indians in cash for supplies instead of with store-orders. Under his management the tribes quickly became self-supporting. He died at Chicago on March 21 1890.

GENERAL CROOK

Crookes, Sir William, an eminent English chemist and electrician, was born at London in 1832, and educated at the Royal College of Chemistry. In 1855 he became professor of chemistry at the Science Training College at Chester; in 1859 founded *The Chemical News;* and in 1864 became editor of the *Quarterly Journal of Science.* Subsequently he became a member of the council of the Royal Society, vice-president of the Chemical Society and prize-winner and gold-medalist of the French *Académie des Sciences.* His researches in physics and chemistry led in 1861 to his discovery of the metal thallium; of the sodium amalgam process for separating gold and silver from their ores; of other important discoveries in molecular physics and radiant matter; and to the invention of the radiometer and the otheoscope. In 1871 he published *Select Methods in Chemical Analysis;* subsequently *The Manufacture of Beet-Root Sugar in England; Handbook of Dyeing and Calico-Printing; Treatise on Metallurgy;* Wagner's *Chemical Technology;* Auerbach's *Anthracen and Its Derivatives;* Ville's *Artificial Manures;* with *The Profitable Disposal of Sewage* and *The Wheat Problem.* The latter consisted of an address delivered before the British Association in 1898. Dealing with physical research and the wheat problem, it created much interest and discussion. He was an authority on sanitation, and studied spiritualism scientifically.

Croquet, a popular outdoor game, played on a grass lawn or levelled dirt-court under given rules. These rules, if adhered to and followed, and where the player is skilled in checkmating his own and his party's opponent, make a match well-nigh as interesting as a game of billiards, especially if all the players, who may be two or eight in number, are experts. The players, who are each furnished with a mallet and ball, are divided into pairs of partners, each playing alternately, the contest or feature of the game being to get one's ball from the starting point (the near stake), first through the various hoops (usually from 6 to 10 in number) placed upright in the ground in a defined order, to the farthest stake or goal, and back again.

Cross, Mrs. (Marian Evans). See ELIOT, GEORGE.

Cross, Mrs. George Frederick (Ada Cambridge), the novelist, was born at St. Germains, Norfolk, Nov. 21, 1844. Upon her marriage to the Rev. Mr. Cross in 1870 she sailed for Victoria, her home, with a sojourn in various bush-districts, until she settled at Williamstown in 1893. Mrs. Cross's published works include 15 or more volumes, from *My Guardian* (1877) to *Thirty Years in Australia.* (1903)

Cross-Pollina'tion (in plants), the transfer of pollen from the stamen to the stigma of another flower. See POLLINATION.

Cross, Southern, one of the star-groups in the southern heavens. Its right ascension is approximately 12 hours: its declination 60° south. The four main stars form a rough cross. It has been invisible from north of the latitude of Alexandria, Egypt, for 18 centuries. The Portuguese explorers of Africa about 1450 were the first modern Europeans to see it.

Crow, a bird of black plumage, belonging to the *Corvidæ* family, which includes jackdaws, ravens, rooks, bluejays and magpies. It is very extensive, embracing some 200 species, and its representatives are found in all parts of the world, except New Zealand, and sparingly in the Australian region. Six members of the family live in the eastern United States. The common American crow is abundant, is distributed generally in this country, and remains with us the entire year. In the winter crows assemble in great numbers in rookeries or crow-roosts. There are a number of these roosting-places in various parts of the country; the one on the Potomac near Washington is well-known. The number that assemble there at one time has been estimated at 40,000. The crows are usually considered to be destructive birds, but they do more good than harm. They injure cornfields to a considerable degree, but they also destroy many cutworms, beetles, grasshoppers, tent-caterpillars and other injurious insects, and thereby compensate for their own misdeeds. They also kill field-mice, rabbits and other rodents, follow the plow in the early spring, and eat the larvæ, field-mice and worms in the furrows. These wily birds soon lose all fear of the farmer's scarecrow, but remain suspicious of bits of bright tin swinging from cords stretched across a field, and they will not go near corn that has been dipped in tar. The birds are models of family affection; the male feeds his mate while she is on the nest, broods the eggs when she is absent, and stands guard with untiring zeal; and both parents long keep watch over their young.

Crozier, John B., born in Ontario and educated at Galt and the University of Toronto, graduating in 1872. Soon after, he went to London, England, and commenced the practice of medicine. In 1880 appeared his *Religion of the Future,* a work of merit. In 1885 his *History of Intellectual Development* followed, and in 1887 he published *Lord Randolph Churchill.* His *Civilization and Progress* has reached a third edition.

Cruikshank (*krŏŏk'shăṅk*), **George,** an English cartoon-etcher, was born at London, Sept. 27, 1792. His father and elder brother were caricaturists. He thought of becoming an actor; but a publisher who saw some of his sketches talked him into illustrating children's books and songs. But he soon found that his genius lay in cartoons. His

finest etchings, perhaps, were those in *Peter Schlemihl*, Grimm's *German Popular Stories* and Dickens' *Oliver Twist*. His powerful series of *The Bottle* showed the evils of drunkenness in a strong light. He died on Feb. 1, 1878.

Crusades, The (from Portuguese *cruzado*, "marked with the cross"), is the name given to the religious wars carried on during the middle ages between the Christian nations of western Europe and the Mohammedans. The first of the crusades was undertaken (1096-9) to uphold the right of pilgrims to visit the Holy Sepulcher at Jerusalem. The Arabs had generously allowed the pilgrims, who came in thousands, not only to visit the sepulcher but to build a church and hospital in the city. In 1065 the Seljuk Turks conquered the country. At once the pilgrims were molested and treated with cruelty. Peter the Hermit, a Frenchman, who had himself made a pilgrimage and had witnessed the cruelties of the Turks, with the pope's sanction (1095) wandered over Europe, preaching everywhere to crowds in the open air, telling how Christians were beaten, robbed and murdered. Europe was roused from end to end. At a council, held at Clermont, France, to consider the matter, the pope's speech was interrupted by cries of "God wills it!" This became the war-cry of the enterprise; the badge worn was the cross, from which came the name crusade.

The following, in brief, comprises the annals of the various crusades: First, four rabble hordes went forth, viz., 20,000 under Walter the Penniless, followed by 40,000 under Peter the Hermit, who were badly cut to pieces in Bulgaria and the survivors utterly overthrown by the Turks at Nicæa; then issued 15,000 Germans who were scattered and slaughtered in Hungary, which also proved the grave of 200,000 poor wretches from England, France, Flanders and Lorraine. But soon came six armies of real crusaders under Godfrey of Bouillon, Robert, Duke of Normandy and others, accompanied by Tancred, the hero of the crusade; in all some 600,000. The sultan's capital, Nicæa, fell in 1097. Next Edessa, and then Antioch after a fearful siege of seven months, the Christian army melting away from famine, sickness and desertion. Two hundred thousand Seljuks now besieged the westerners. When they were routed, only 400,000 men were left to march on Jerusalem. The city fell; Godfrey of Bouillon was chosen king; soon all Palestine came into his hands; and for 50 years the crusaders held the principalities of Edessa, Antioch and Jerusalem. At Jerusalem were founded the two famous orders of the Knights Hospitalers of St. John and the Knights Templars.

In 1144 Edessa was conquered and the Christians slaughtered. A second crusade, preached by the famous St. Bernard, was led in 1147 by Conrad III of Germany and Louis VII of France. About 1,200,000 soldiers marched under them, only to be defeated, Conrad's army, by the treachery of the Greek emperor, near Iconium, and Louis' army in the Pisidian Mountains.

The deathblow to the kingdom of Jerusalem came from a young Kurdish chief, who had made himself sultan of Egypt and sought to become sovereign of all the Moslems—the famous Saladin. His conquest of Jerusalem (1187) gave rise to the third crusade, led by Philippe Auguste, king of France and Richard the Lion-heart, king of England. Acre was attacked (1190), and 23 months later it surrendered. But the leaders quarreled, Philippe went back to France, and Richard, after performing prodigies of valor, which excited the admiration of the Saracens, made a treaty with Saladin (1192), by which the people of the west were to be at liberty to make pilgrimages to Jerusalem without being taxed. The fourth crusade (1203) never went near Palestine, but founded the Latin Empire of Constantinople, which lasted 56 years.

One of the strangest happenings in history is the children's crusade, which took place in 1212. An army of French children, 30,000 strong, headed by a peasant-boy named Stephen, set out for the Holy Land by way of Marseilles. A like army of German children, 20,000 strong, led by a boy named Nicholas, crossed the Alps at Mont Cenis. A second army of German children, numbering nearly 20,000, crossed the Alps by a more easterly route, touching the sea at Brindisi. Their idea was that the Mediterranean would open a path for them to Palestine and that Jerusalem would be recovered and the Moslems made Christians by miracles. Some of the children became discouraged and returned to their homes, many stopped by the way, but most of them either perished on the march, or were lost at sea or sold into slavery.

The fifth crusade (1228) made Frederick II of Germany and Sicily, king of Jerusalem. In 1244 a new horde of Turks made themselves masters of Jerusalem. A sixth crusade (1249) followed, led by Louis IX of France, against Egypt, now held to be the key to Palestine. Louis was taken prisoner, and had to pay a heavy ransom. The seventh crusade (1270) was led by him and by Prince Edward, afterward Edward I of England. Nothing was accomplished by this adventure, however. Acre, Antioch, and Tripoli were held by the Templars and other knights for some time; but Acre, followed by the others, surrendered in 1291.

Crustacea (*krŭs-tā'shĕ-ȧ*), the name of a class of animals embracing the shrimps, prawns, crayfish, lobsters and a number of minute forms called water-fleas. They belong to a larger group or subkingdom (*Ar-*

thropoda) which, besides the crustacea, includes the insects, myriapods and spiders. These four are all *classes* of the great subkingdom *Arthropoda*, and therefore are equivalent groups. The crustacea pass through a metamorphosis, hatching from the egg in a different condition from the adult. Most of them live in the water and breathe by gills, but there are some terrestrial forms, like the pill-bug, which is to be found in dark places, under boards, under bark, in cellars. Some of the minute forms, called water-fleas, carry their eggs in cases attached to the body.

Cryp'togams. A name applied to all those plants which do not produce seeds, including therefore *Pteridophytes* (ferns, etc.), *Bryophytes* (mosses, etc.) and *Thallophytes* (*Algæ* and *Fungi*). The name was given under the impression that the sexual reproduction was hidden or obscure, when in fact it is more evident than in the seed-plants (*Spermatophytes*), which were called phanerogams, meaning "evident sexual reproduction." The mistake arose from the false idea that the stamens and pistils of flowering plants are sex-organs. The name *Cryptogam*, however, is convenient, although meaningless. Since the *Pteridophytes* have woody vessels, they are often called vascular *Cryptogams*, to distinguish them from *Bryophytes* and *Thallophytes*, which are *Cryptogams* without woody vessels.

Cuba, formerly a Spanish colony and called the Queen of the Antilles, is the largest island of the West Indies. It lies at the entrance of the Gulf of Mexico, between the Straits of Florida and the Caribbean Sea, with Haiti and Santo Domingo immediately east of it and the British island of Jamaica to the south. It is 730 miles long, and on the average 80 miles wide, with an area of 44,164 square miles. There are many good harbors, that of Havana being one of the largest and finest in the world. On the southeast are mountains, the tallest peak, Pico de Tarquino, rising 7,670 feet. Only in the province of Oriente are the mountains formidable or unavailable for cultivation. Mineral water and caverns in which are beautiful stalactites abound. No month is free from rain, but the temperature does not materially differ from that of Florida, though frosts are unknown Earthquakes in the east are frequent, and the island is sometimes swept by hurricanes, one of which in 1846 destroyed 216 vessels and 1,872 houses. In natural resources Cuba is far the richest of the Antilles, and could support over 15,000,000 people. The soil is exceptionally rich, easily worked and capable of the greatest degree of tillage. Some localities are rich in minerals, as asphalt, copper, iron and lead. Native plants number over 3,350. Virgin forests contain immense quantities of many varieties of valuable timber. There are no venomous snakes nor dangerous wild beasts. Tobacco, coffee, cotton and fruits are raised; but the great crop and export is sugar. Cuba depends wholly upon agriculture for its prosperity, the sole manufactures being cigars and sugar. The main trade is with the United States, and the reciprocity-treaty made in 1891 has increased the trade between the two countries. The cultivation of oranges and potatoes for export is growing, the Cuban potato equalling that of Bermuda. The capital is Havana, which has a university. (Population over 300,000.) The other cities are Santiago de Cuba, Matanzas, Cienfuegos, Puerto Principe and Cardenas. The larger cities are mostly on the coast, a fact that indicates their commercial character Five or six railways are in operation, and nearly as many more are being built. The island is divided into six provinces or political divisions, which since 1898 have been in considerable social, commercial and political disorganization This was restored to some semblance of order under the excellent administration of the United States governor-general, Leonard Wood. Cuba was the most important colony of Spain, and was ruled by a captain-general. Columbus discovered the island in 1492, and said it "was the most beautiful land that eyes ever beheld." From 1868 to 1878 Cuba was in a state of revolution, which greatly retarded its growth. Its many slaves were freed in 1878. Population, 2,150,112. As native whites form 59% of the population, colored people 32% and foreign whites 9%, their numbers would seem to be 1,166,402 Spaniards and Creoles, 649,050 negroes and mulattoes, 15,000 Chinese coolies and 182,545 foreign whites. Immigration has increased rapidly. In 1902 the immigrants numbered 11,000, but in 1905 they were over 54,000 in number, excluding 6,000 colonists or settlers from the United States.

The later history of the island may be briefly told. In 1895 the Cubans again revolted, claiming that the treaty of 1878 had never been kept in good faith; that, while names and forms had been changed, the tyrannical and oppressive policy of Spain had been continued. After desultory outbreaks in different provinces, a Cuban force of 10,000 men was organized under Maximo Gomez and Antonio Maceo, both of whom had been leaders in the former revolt (1868-78). For three years the war raged, marked by desperate bravery as well as by most cruel atrocities and the devastation of the island by fire and sword, without decisive results.

The cruelties practiced by the Spaniards upon the Cubans, including innocent women and children, excited universal horror, and led to repeated protests on the part of the United States government Spanish hatred

of the United States was thus engendered, which reached a climax when the United States battleship *Maine*, on a friendly visit in the harbor of Havana, was destroyed by a submarine mine on Feb. 15, 1898. Hostile action quickly followed, and war between Spain and the United States was declared on April 24. On July 3 the American fleet under Admiral Sampson destroyed Spain's strongest fleet off Santiago. Meanwhile Santiago was besieged by the United States forces under General Shafter. A fierce battle was fought on July 1, and on July 17 the Spanish general surrendered with his army of 25,000 men. Peace negotiations followed, and by treaty signed on Dec. 10, 1898, Spain surrendered all sovereignty over Cuba, and ceded Porto Rico to the United States. On Dec. 28th the United States formally took the island over for military occupation temporarily. It was the declared policy of the United States to promote the independence of Cuba and surrender all jurisdiction in the island so soon as a firm and stable government should be established. To this end, under military occupation of the island, the United States proceeded to establish order, organized civil and municipal governments, established schools throughout the island and provided for a convention of the people, under which a constitution was formed and the Republic of Cuba established. On May 20, 1902, the authority of the United States was withdrawn, and on the same day Tomas Estrada Palma, who had been elected president of the republic, was inaugurated. Four years later he was re-elected, but gross frauds were charged, disaffection spread and in September of 1906 the island was swept with a whirlwind of revolution. The government was helpless. President Palma called upon the United States to intervene as provided by treaty, and resigned his office, the insurgents acquiesced and laid down their arms, and for a second time the United States assumed temporary jurisdiction of the island and established a provisional government. After administering the island for two years, during which many reforms were inaugurated and public tranquillity was restored, the provisional government caused a popular election to be held in December, 1908. This resulted in the election of a new government with José Miguel Gomez as President. This new government was duly inaugurated and in February, 1909, the authority of the United States was finally withdrawn and the Republic of Cuba was again established.

Cuckoo, a bird named from its *coo coo* cry, found both in the Old and the New World. The European cuckoos have the habit of laying their eggs in the nests of other birds—usually smaller birds than themselves. But this habit is not common to all members of the group, for a number of the cuckoos make nests. The two forms common in the northeastern United States are the yellow-billed and the black-billed cuckoos, birds with noticeably long tails, of an olive-brown color above and white below. They make a loose nest of twigs, and lay four or five eggs of a pale, greenish color. They destroy many injurious caterpillars, and one writer suggests they might well be called the caterpillar-bird. They are shy birds, and the call of the rain-crow, as they are commonly called, is better known than the bird itself. It is a series of *tut-tuts*, followed by *cl-uck-chucks*, and then a loud *cow-cow-cow*.

BLACK-BILLED CUCKOO

Cu'cumber. See CUCUMIS.

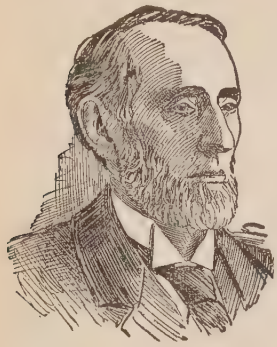
Cu'cumis. A genus of plants of the gourd family, to which belong the various forms of muskmelons and cucumbers. It belongs to the tropics and contains about 30 species, mostly in Africa and the East Indies. The numerous forms of muskmelon, cantaloupe, etc. are forms of the *C. Melo* from southern Asia. The cucumbers are forms of *C. Sativus*, also from southern Asia.

Cul'berson, Charles A. (1855–), governor of Texas and U. S. senator, born in Alabama, and moved with his parents in 1858 to Gilmer, Texas, and later to Jefferson and to Dallas. After studying law he practiced that profession, and in 1890 became attorney-general of the state, and subsequently governor. In 1899 he was elected U. S. senator, and was re-elected in 1905, 1911 and 1917.

Culloden (*kŭl-lōd'en*), a tract of moorland, about five miles from Inverness, Scotland. Here, April 16, 1746, was fought a battle which put an end forever to the hope of the Stuarts of regaining the English throne. The Duke of Cumberland, with his artillery and disciplined troops, was more than a match for Charles Edward, the young Pretender, whose little army of Highlanders were worn out by a night march, and were half-starving and broken by desertion. After a desperate and bloody attack, the English stood firm and the Highlanders broke and fled.

Cullom, Shelby Moore, United States senator and Republican governor of Illinois (1876–83), was born in Wayne County, Ky., Nov. 22, 1829. In 1830 he removed with his parents to Illinois, and studied law and practiced at Springfield, where he had his home. In 1856 he was elected to the Illinois legislature, and in 1860 was speaker of the chamber. From 1865 to 1871 he represented his district in Congress, when he

re-entered the Illinois legislature and once more became speaker. In 1876 and again in 1880 he was governor of his state, but resigned in 1883 to become United States senator. He remained in the senate continuously after that date, being re-elected successively in 1889, 1895, 1901 and 1907. Senator Cullom nominated Grant for the presidency in 1872 and always took an active part in railroad legislation. In 1886 he was chairman of the Interstate Commerce Commission, later chairman of the committee on foreign relations; and in 1898 was appointed one of the commissioners to establish United States government in Hawaii. He died January 28, 1914.



SHELBY M. CULLOM

Culpeper or **Colepeper, Thomas, Lord,** colonial governor of Virginia (1680–83), was born in England in 1664 and died there in 1719. In 1669 he purchased lands in Virginia lying between the Potomac and the Rappahannock, and in 1673, with Lord Arlington, received from King Charles II a grant of the whole territory of Virginia. Later on he was appointed governor of the province, and personally ruled there between the years 1680–83, and acted despotically, annulling the privilege of appeal of the colonists to the local assembly. In 1683 he withdrew from his governorship, and in violation of orders returned to England, where he was deprived of his patent as governor and prosecuted. At his death his large estate in Virginia passed to Lady Fairfax, his daughter.

Cumberland, Md., the county-seat of Allegany County, on the north bank of the Potomac at the mouth of Wills Creek and the western terminus of the Chesapeake and Ohio Canal. It lies about equidistant from Pittsburg, Pa., and Baltimore, Md., and is the seat of an extensive coal-trade from the semi-bituminous coal-seams of the region. It also has many industries, including those for the manufacture of steel, iron, glassware, besides foundries, machine and repair shops, flour, cement, silk-mills, etc. It has a number of good public grammar-schools, a public high-school and an academy. Population, 27,000.

Cumberland Mountains are a part of the great Appalachian group, running along the southwest border of Virginia and the southeast border of Kentucky, crossing Tennessee into the northeastern part of Alabama. The ridges rarely are over 2,000 feet high, while the range is about 50 miles broad. It is the southwestern extension of the Alleghanies, and sometimes is called the Cumberland Mountain-plain.

Cumberland River rises in Kentucky, flows into Tennessee and, coming back to Kentucky, enters the Ohio after a course of about 650 miles. Nearly 600 miles to Burnside are navigable for steamboats. Near Williamsburg, Ky., there is a fall of 60 feet.

Cumberland, R. I., a town in Providence County, six miles from the city of Providence. It manufactures cotton-goods and iron-wares, and has the service of the New York, New Haven and Hartford Railroad. Population, 10,107.

Cumberland Road, an early highway, constructed by the national government to connect Cumberland, Md., on the Potomac, with the Ohio River, an undertaking of much importance in opening up the west and southwest to the east before the era of railways. The project was begun about 1806, and was completed as far as Illinois about 1838, at a total cost to the federal government of close upon $7,000,000. Under the name of the Great National Pike the road was held under national control; but in 1856 it was turned over to the several states through which it passed. In his day Henry Clay was influential in obtaining the necessary sums from the nation to construct the road.

Cuneiform (*kū-nē'ĭ-fôrm*), a form of writing in which the parts comprising it are like a wedge or arrow-head. It was used by the ancient peoples of Akkad, Babylonia, Assyria, Armenia, Elam and Persia, and was cut upon stone, bronze, iron, glass and clay in the shape usually of columns, bricks or cylinders. It was used from about 3800 B. C. until after the era of the birth of Christ. The cuneiform signs were first pictures of objects, a circle, for example, standing for the sun; but little by little these signs became so changed that there was no resemblance to the object it stood for. For 1,600 years after the writing ceased to be used, its meaning was wholly lost sight of, nor for a long time was it known that it was writing at all. One so-called authority deemed the writings only the idle fancies of the architect, who had tried to see how many arrowheads and other strokes could be cut on a brick. Another supposed them the work of worms. A third thought them charms, which, if they could be read, would open huge vaults of gold and pearls. A fourth great scholar held that they were in the unknown language by which the Almighty had talked to Adam. The translating of these wedges is a triumph, by the side of which the reading of a modern cipher is child-play. Many scholars have gained name and fame by

merely spelling out a few letters. These inscriptions are found to be mostly histories of reigns. For example, the great Behistun inscription gives an account of the reign of Darius Hystaspes, king of Persia, enumerating lists of his ancestors, a description of the extent of his power, the main events of his reign, the palaces he built and his prayers. Cuneiform inscriptions are of the first importance in the light they throw on those great early eastern empires and on facts mentioned and referred to in the Bible.

Cu'pid, called also Amor, the Latin name for the Greek god Eros, is the god of love and the son of Venus. He appears as a boy, playful and mischievous, with bow and arrow, and sometimes with torch, quiver and wings. His eyes are often covered so that he shoots blindly. His darts were said to pierce the fish at the bottom of the sea, the birds in the air and even the gods in Olympus. Praxiteles' statue of Cupid is famous as a representation of the god.

Cu'pule (in plants), the peculiar involucre which invests the nuts of the oak, beech, chestnut, etc. The bracts of the involucre coalesce, and in the acorn form a cup-like structure. The name is also applied to cup-like structures which appear on the bodies of certain liverworts, as Marchantia, and which contain the peculiar reproductive bodies called gemmæ.

Curaçao (*kōō-rä-sō'*) is the most important of the Dutch West Indies. It is situated about 40 miles from Venezuela, and is about 40 miles long by 10 broad, covering an area of 210 square miles. The chief product is salt. From the peel of the Curaçao orange is made, in Holland, the Curaçao liqueur. The capital, Willemstad, is the headquarters of the government of the Dutch West Indies, including besides Curaçao, Aruba, Bonaire, St. Eustache, Saba and the Dutch part of St. Martin, with a population of 53,486. The trade is mainly with the United States, and consists of maize, beans, pulse, salt and phosphate of lime, besides cattle. Curaçao was discovered by the Spaniards in 1527, was taken by the Dutch in 1634, conquered by the English in 1798 and again in 1806, and restored to Holland in 1814. Population, 31,587.

Curculio. See AVERIL.

Curfew. See BELL.

Curie (*kū-rē*) **Pierre** (1859–1906), joint discoverer with his wife, Madame Sklodowska Curie (1867), of radium. Mons. Curie, son of a noted metallurgist near Paris, was himself professor of physics and chemistry at the Sorbonne, and for many years pursued laborious investigations as to the radial activity of metallic uranium. In this he was substantially assisted by his talented wife, a Pole, who had herself discovered a new metal, which she named polonium. Jointly, while continuing their investigations, they succeeded in separating radium from the barium extracted from several tons of pitchblende, and for this they were rewarded by the Royal Society of London, which body conferred upon the Curies (husband and wife) the Sir Humphrey Davy gold medal. In April, 1906, M. Curie was accidentally run over by a wagon and killed in the streets of Paris. The discovery of the Curies is admittedly a momentous one, since it is possible by it to explain some of the grave riddles of the universe, especially such as have to do with heat-radiation, without combustion or chemical change and without any appreciable increase in its energy.

Curling, a winter outdoor game played with round, flattened stones furnished with a handle (the stones being about 36 inches in circumference) on an ice-rink. It is a familiar game in Scotland, and is now played more or less extensively in the United States and Canada. The game consists in playing four on a side in matches (each player having two stones) from a tee at one end of the rink, marked by a circle, to a tee at the far end, 40 yards apart—the object being to plant the stone near to the far tee and to guard it there, as well as to drive out the stone of an opponent. The weight of stone and handle is usually about 50 pounds; and each player makes use of a broom to clean the ice of any snow or impeding obstacles that may prevent the stone of a player, on one's own side, reaching the tee or striking aside an adversary's stone. Around each tee is a circle of seven feet radius, called the home or ring, while behind the near tee and beyond the far one are 12 feet spaces, divided into "back-scores." Between the two tees (114 feet apart) is a middle score line; while at either end (21 feet from each tee) is an intervening line called the hog-score. Two leaders called skips command the opposing teams and have the management of the game, each for his own side. The highest possible score in the game is 72. Curling is a most healthful, manly game, and has the positive advantage of having little or no betting attached to it.

Cur'ran, John Philpot, a famous Irish orator, was born on July 24, 1750, at Newmarket, Ireland. He was idle and reckless, both while at school and at Trinity College, Dublin. While studying law in London, he had his earliest practice in speaking at the students' debating societies. On his first rising in court, he was so nervous that he could hardly read the few words of a legal form, and, when told by the judge to read more clearly, he could not go on at all. But he soon conquered this, and his wit and eloquence made him famous throughout Ireland. He became a member of the Irish house of commons, was supporter of Grattan, and, though a Protestant

himself, had a warm sympathy with his suffering Catholic countrymen, and spoke eloquently in favor of the government's changing the policy of oppression which was driving them into rebellion. Curran's chief fame came from his speeches in court in behalf of the leaders of the rebellion of 1798, which made him beloved by the whole country. The union of Ireland with Great Britain that followed, Curran opposed as the destruction of his country. His health broken, deserted by his wife, his daughter dead of a broken heart soon after the execution of her lover, Robert Emmet, Curran drudged through eight years as master of the rolls. His last three years were spent in London, where his life was brightened somewhat by the brilliant society of Sheridan, Erskine and Thomas Moore. Curran's little figure, ugly face, bright, black eyes and great vivacity easily marked him out from all others, and his wit, sharpness and brilliant flow of language have hardly ever been equaled. He died Oct. 14, 1817.

Cur'rant. Species of the genus *Ribes*, which belongs to the saxifrage family. Associated with the currants in the genus are the gooseberries. The genus contains numerous species which are widely scattered, many of them being native to North America. Four species are cultivated in American gardens. *R. rubrum* includes the red and white varieties, and is found wild in both Europe and North America. *R. nigrum* is the European black currant. *R. Americanum* (*R. floridum*) is the American black currant, very similar to the European form. *R. aureum*, the Missouri or Buffalo currant with spicy, yellow flowers, is usually grown as an ornamental shrub, being native to western North America.

Currency Law. President Wilson, in signing the measure known as the Glass-Owen Currency Bill, Dec. 23, 1913, defined its purpose: "To furnish the machinery for free, elastic and uncontrolled credits."

A "United States" of Banks. This law brings the banks of the United States into co-operation with the Government and with one another in a system corresponding to that of the Union itself—with its central and state governments and the sub-divisions of the latter.

Need for "A More Perfect Union." Business transactions are mainly based, not upon money, but upon credit. Credit is based not alone upon money and other assets but upon confidence in "the business situation;" so that the mere existence of a banking federation to provide for financial needs and emergencies not only supplies those needs but has a strong tendency to prevent panics and depressions.

The law provides for broadening the basis of credits: (a) By permitting banks to re-discount at Federal Reserve Banks under Government control, the paper which they, themselves, have received as security for loans; (b) by including as lawful security paper issued for industrial and commercial purposes, and paper maturing in six months, secured by agricultural products. National banks, except those in the Central Reserve cities of New York, Chicago and St. Louis, may also make direct loans on five year farm mortgages; (c) by allowing member banks to accept bills of exchange at not more than six months sight drawn against imported or exported goods; (d) by permitting or compelling one Federal Bank to loan to another on discounted paper; (e) by providing for printing, by the Government when needed, of Treasury Notes to be issued by these Reserve Banks and secured by the re-discounted paper referred to under (b). The Reserve Bank is also required to hold in gold 40% of the value of these notes and they are guaranteed by the Government and redeemable in gold. In times of unusual demand for money, the Government may temporarily suspend the gold reserve provision.

The leading features of the law, as effecting the borrower and business conditions, may be summarized as follows:

The country is divided into districts in each of which the Government locates a Federal Reserve Bank. All national banks in each district must, and any state bank in the district may, under certain requirements, take stock in this bank equal to 6% of capital and surplus. Federal banks can loan only to their stockholders or "member banks." Their sources of profit are interest on these loans and profits on dealings in designated securities. Dividends are restricted to 6%, earnings above 6% (and surplus fund requirements) going into the United States Treasury.

A very close control of this banking federation is vested in a Federal Reserve Board at Washington, consisting of seven members (one of whom must be Secretary, and another Comptroller of the Treasury) appointed by the President with consent of the Senate.

Powers: Of the nine directors of each Federal Bank, the Board appoints three, one of whom acts also as the "Federal Reserve Agent" through whom the Board and the Federal Banks communicate with each other; can remove directors of Federal Banks; in emergency, in its judgement, can suspend restrictions as to Federal Bank reserve; decides as to renewal of loans by Federal Banks and rate of interest to be charged from time to time on the Treasury notes and on loans.

To prevent the over-loaning of money for undue expansion and other dangerous and speculative ventures there are, in addition to the control provided by the close articulation of the Government and the banks, these checks upon inflation: (a) The fact that the Secretary of the Treasury can withdraw Government funds from a Federal Bank, thus reducing the basis of loans; (b) the fact that Member Banks must pay interest on borrowed money; (c) the fact that one Federal Bank cannot, under penalty of a heavy tax, re-issue the Treasury notes of another Federal Bank; (d) although the Board may suspend the gold reserve provisions in times of unusual demand for money, a heavy tax, the amount of which is in the discretion of the Board, may be imposed on the Treasury notes when the Reserve falls below the 40% required under the law. (See BANKS, MONEY, MINT.)

Curry, Jabez Lamar Monroe (1825-1903), American educator, lawyer and minister, was born in Lincoln County, Georgia. He was a member of the Confederate Congress. After the war he became a minister, and later professor of law at Richmond College. For four years (1881-85), he acted as general agent of the Peabody Educational Fund and later was chairman of the Educational Committee of the Slater Fund. From 1885 to 1888 he represented the U. S. as minister at Madrid. His published writings embrace a treatise on *Constitutional Government in Spain*, a memoir of *William Ewart Gladstone* and a work, issued in 1894, on *The Southern States of the American Union.* Besides a *History of the Peabody Educational Fund*, he wrote a work on *Establishment and Disestablishment in the United States.*

Curtis, George Ticknor, American writer on legal topics, was born at Watertown, Mass., Nov. 28, 1812; and died at New York, March 28, 1894. Graduating at Harvard in 1832, he studied law and was admitted to the bar, practicing first at Boston and later at New York. He served for some years in the Massachusetts legislature, but at length devoted himself to the writing of legal text-books and the compilation of decisions in the courts of common law and admiralty in the United States. One of his most notable works is his *History of the Origin, Formation and Adoption of the Constitution.* Another useful work is his *Constitutional History of the United States from* 1792–1864. He also wrote lives of Daniel Webster and James Buchanan.

Cur'tis, George William, American author, was born in Providence, R. I., Feb. 24, 1824. As a boy he spent a year in New York as a clerk, and worked for some time as a farm-hand in Massachusetts. His first book, *Nile Notes of a Howadji*, was written after traveling in Egypt and Syria. He was one of the first editors of *Putnam's Monthly*, founded in 1852. He also was a partner in the undertaking, though having nothing to do with the business management. When, in 1859, the enterprise failed, Mr. Curtis sank all his fortune in the endeavor to save the creditors from loss, which he accomplished after six years' struggle. He wrote many essays, sketches and novels, and was successful as a lecturer. He is best known as the editor of *Harper's Weekly* and editor of the *Easy Chair* in *Harper's Magazine.* Mr. Curtis was prominent in politics, acting with the Republican party till 1884, but afterward supporting the Democrats. He died on Staten Island, N. Y., Aug. 31, 1892.

Curtius (*kōōr'tē-ŭs*), **Ernst,** was born Sept. 2, 1814, at Lübeck, Germany. He studied at Bonn, Göttingen and Berlin Universities. He made careful journeys in Greece, held several university professorships, and soon became noted as a writer on Greek history and geography. His great work, *The History of Greece*, is in the front rank of histories. Dr. Curtius was, late in life, professor at the University of Berlin. He died on July 12, 1896.

Curwen, John (1816–1880). Originator of the Tonic Sol-fa method of teaching singing. He was educated for the ministry at University College, London, but became author of *Grammar of Vocal Music; A Tonic Sol-fa Primer; Musical Theory; Musical Statics;* and other useful works.

Curzon, George Nathaniel, Marquis, ex-viceroy and governor-general of British India, was born at Kedleston Hall, Derbyshire, England, on Jan. 11, 1859, and educated at Eton and at Balliol College, Oxford. He entered Parliament in the Conservative interest in 1886, and was subsequently under-secretary of state for India and under-secretary for foreign affairs. Lord Curzon has traveled considerably and published a number of thoughtful books. In 1895 he married the eldest daughter of Mr. L. Z. Leiter, a Chicago millionaire. In 1898 he was appointed by the Marquis of Salisbury, Viceroy of India, a post which he has filled with high ability. His writings include *Russia in Central Asia; Persia and the Persian Question;* and *Problems of the Far East.* In 1898 he was created Baron Curzon of Kedleston. His term of office as Indian Viceroy was extended. In June, 1905, difficulties over the new military scheme in India led to his resigning. The resignation was withdrawn upon solicitation of home-authorities, but in August controversy again reached an acute stage, and Lord Curzon finally relinquished office. He remained in India to receive the Prince and Princess of Wales. The London *Times* spoke of his work as "among the most brilliant and strenuous accomplished for the empire in our times," and of his having infused into Indian civil administration a new spirit born of his own indomitable belief in reform. After his return to England he took a leading part in public life, particularly in the opposition to the Lloyd George budget of 1909 and the Parliamentary Reform Bill of 1910. During the World War he was a member of the coalition cabinet in various offices, and afterwards became minister for foreign affairs.

Cushing, Caleb, American diplomatist and jurist, was born at Salisbury, Mass., Jan. 17, 1800; and died at Newburyport, Mass., Jan. 2, 1879. After graduating at Harvard, he studied law, traveled in Europe, was a member of the Massachusetts legislature, and finally became a member of Congress. He served for eight years in the house, and in 1843–44 was United States commissioner to China. From 1845 to 1847 he

served in the Mexican War, and was raised to the rank of brigadier-general. In 1852 he was appointed associate-justice of the supreme court of Massachusetts, and in the following year became United States attorney-general. In 1871-72 he acted as counsel at the tribunal of arbitration in Geneva; and from 1874 to 1877 was United States minister to Spain. Mr. Cushing published a number of works; but his chief publication was an account of *The Treaty of Washington* (1873).

CALEB CUSHING

Cushing, William Barker, American naval officer, whose distinguished service was the destruction of the Confederate iron-clad *Albemarle*, was born in Wisconsin in 1842; and died at Washington, D. C., Dec. 17, 1874. He entered the Naval Academy in 1857, and in 1861, before graduating, he joined the United States navy and served throughout the Civil War. His most noted act occurred Oct. 27, 1864, at Plymouth, N. C., when, with a volunteer crew on a steam-launch and amid the hot fire of Confederate guns, he approached the Confederate ram, *Albemarle*, and fired a torpedo under her, which destroyed the iron-clad, along with his own launch. Cushing and some of his men swam ashore and escaped. For his gallantry the young hero was officially thanked by Congress, and in 1872 was advanced to the rank of commander. He died at the national capital two years later.

Cush'man, Charlotte Saunders, an American actress, was born at Boston in 1816. Her father became bankrupt and she helped to support the family when only 12 years old. She sang in concerts and made her first appearance in opera at Boston, in 1835, but soon after that lost her fine contralto voice. Not discouraged, by any means, she at once fitted herself to become an actress. Her appearance in New York as Lady Macbeth was a success. She afterward acted with Macready, and also gained fame in England. Miss Cushman died at Boston, Feb. 8, 1876.

CHARLOTTE CUSHMAN

Cus'ter, George Armstrong, an American general, was born at New Rumley, O., Dec. 5, 1839. He graduated at West Point in 1861, and as second lieutenant of United States cavalry made his first charge at Manassas, driving a Confederate force across Muddy Creek. As assistant-engineer at Yorktown, he planned the earthworks nearest the enemy's lines. He was the first to cross the river at Chickahominy, and while brigadier-general of cavalry routed Hampton's cavalry at Gettysburg, where he had two horses shot under him. In 1864 his brigade led the column in Sheridan's raid toward Richmond. He was brevetted major-general of volunteers for gallantry at the battle of Cedar Creek, and was in command of a division at the surrender of Appomattox. His rash but memorable campaign against the Sioux was undertaken early in 1876. With 1,100 men, including guides and scouts, he followed an Indian trail to Little Big-Horn River. Here he found a large encampment. Dividing his command, he tried to ford the stream three miles farther down. This brought on a battle in which Custer and his detachment of 277 troopers were surrounded by 3,000 warriors and slain to a man, June 25, 1876.

GENERAL CUSTER

Cu'ticle (in plants). In many plants, especially in leaves, the outer part of the walls of the epidermis becomes transformed into an impervious structure called cuticle. As new wall-material is continuously laid down, the cuticle gradually thickens and may become a very thick layer outside of the epidermis. It is a structure which protects well against drought, cold, etc., and is especially noticeable in plants of dry regions. The same substance is also developed on the surfaces of spores as a protection.

Cut'ler, Manasseh, an American botanist and Congregational minister, was born at Killingly, Conn., May 3, 1742. After graduating at Yale in 1765, he took degrees in the three professions of theology, law and medicine. He then became regimental and brigade chaplain in the Revolutionary War. He was an enthusiastic botanist, and his description of the native flowers of New England was the first botanical description made in the country. In wide scientific and other learning Dr. Cutler was the foremost man in America after Franklin. He is best known for his con-

nection with the famous Ordinance of 1787. A member of the Ohio Company, formed by the Massachusetts army-officers to settle on Ohio lands, the purchase of the lands from Congress was intrusted to him. Some 5,500,000 acres were bought for the Ohio Company and others, and it was Dr. Cutler's making a condition of the purchase that the new settlers should take with them their own laws, that brought about the passage of the ordinance in its present form, including the anti-slavery clause. Dr. Cutler also was a member of Congress from 1801 to 1805. He died at Hamilton, Mass., July 28, 1823.

Cuttlefish, one of the mollusks, with a head surrounded by eight or ten arms, provided with cup-like suckers. Two of these arms are longer than the others, are enlarged on the ends and are called antennæ. They are related to the chambered nautilus, squid, etc. They have no shell externally, but underneath the skin of the back is found a limy structure called cuttlefish bone. It is often seen in bird-cages. The eyes are large and prominent, and there is a pair of horny jaws in the midst of the cluster of arms. The body is elliptical in outline, and has fins running along each side. It is surrounded by a mantle that also incloses a cavity for the gills, which are two in number. There is a funnel-like tube opening into the mantle-cavity, and the animal can, by contracting muscles, cause the mantle-cavity to close and then throw water out through the funnel or siphon in jets. It can swim forward by the use of the fins, and backward by throwing jets of water through the siphon. These animals also possess a bag of inky fluid, some of which can be thrown into the water when they become alarmed, and thus conceal their position while they swim away. Sepia and India ink were manufactured from this ink of the cuttlefish. They are carnivorous and seize their prey by means of their arms. The common squid of the Atlantic coast is closely related. It is commonly used for bait by the fishermen. The octopus or devilfish also is a near relative. See OCTOPUS.

Cutworm, caterpillar of various species of owlet moths, a worm very destructive to vegetation. Both moth and worm are nocturnal. In the latter part of summer the female moth lays her eggs on plants near the ground. The larvæ feed on tender roots of grasses and various plants, and by spring are ready to attack early vegetation. During the day they hide under the surface, and coming forth at night cut off plants close to or just under the surface. They are enemies of garden vegetables, wheat, Indian corn, oats and cereals generally. Lacking other vegetation, almost all the numerous species adopt the climbing habit, ascend grape-vines, rose and berry-bushes and trees, devouring leaf-buds and eating of the early fruit. Hodge recommends, as protection against cutworms, folding a piece of stiff paper around a plant-stem in such a manner that the paper reaches an inch into the ground and two or three inches above the surface. To save their corn-fields, the Indians used to pick the cutworms off by hand, a method still in use. Toads and robins are effective helpers in keeping down the grievous pest.

Cuvier (*kū'vyā'*), **Georges, Baron,** was born Aug. 23, 1769, at Montbéliard, France. At 18 he became tutor in a family at Caen, Normandy, and while all France was in the throes of the reign of terror he peaceably spent his leisure eagerly studying the fossils and fishes of the neighboring coast. He became professor of comparative anatomy at the Jardin des Plants, in Paris. Cuvier was the first to compare the structure of fossils with that of animals, which we now find. He also founded the science of comparative anatomy. In this field his work and success were great, and he was recognized in France as the greatest of living naturalists. He also held office under Napoleon and Louis XVIII, and became a peer of France. He died at Paris, May 13, 1832.

Cuyp (*koip*), **Albert,** Dutch painter, was born at Dordrecht, Holland, in 1605. His pictures represent grazing cattle, moonlight, winter-landscapes, horse-markets, hunts, camps and cavalry-fights; in his paintings the effect of golden sunlight has never been surpassed. While he lived, and long after, his paintings were little thought of, but now they rank high. He died in 1691. His father, known as Old Cuyp, and his nephew, Benjamin, also were well-known painters.

Cyanide-Process, The. The cyanide-process is one of two ways in which gold is extracted from low-grade ores, which contain only from 2 to 10 dollars per ton of gold. The ore is first crushed in stamp-mills, until it is quite fine; it is then treated with a solution of potassic cyanide, which dissolves the gold. This liquid is then treated with zinc, by which the gold is released and precipitated. This method is chiefly employed in the Transvaal gold-mines and, to a less extent, in the low-grade mines of Dakota, Wyoming and other western states.

GLOEOCAPSA, ONE OF THE CYANOPHYCEÆ

Cyanophyceæ (*sī'a-nō-fĭs'ē-ē*). One of the four plant-groups which make up the algæ, commonly called the blue-green algæ, and often the green slimes. They are

the simplest of algæ, the body consisting of single cells or chains and filaments of cells, and are found in fresh water and damp places everywhere. All the forms show a tendency to become imbedded in a jelly-like substance which is merely the material of their walls transformed into mucilage. In addition to the chlorophyll they contain a blue pigment, which gives the bluish hue to their bodies. Many of them exhibit the power of motion, the free filaments of oscillaria moving almost continually, while the chains of nostoc at times wriggle out of the mass of mucilage in which they are imbedded. They have no sexual reproduction, multiplying almost exclusively by ordinary cell-division. In many of their characters, they closely resemble the bacteria, and by many botanists they are associated with them in a common group.

NOSTOC, ONE OF THE CYANOPHYCEÆ

Cy'cads. A group of plants which next to the conifers is the most prominent group of living gymnosperms. They are confined to the tropics and subtropics, and contain about 80 species, nearly equally distributed between the oriental and occidental tropics. The principal genus in the orient is *Cycas*, and in the occident *Zamia*, the latter genus being represented in southern Florida. The stem does not branch, and in many cases rises in a straight column, as in the palm, bearing at its summit a rosette of very large fern-like leaves. In other cases the stem is like a great tuber ensheathed by the thick bases of fallen leaves, and crowned with the rosette of huge fern-like leaves. The seeds are born in cones or strobiles, often of great size, but instead of ripening dry with a hard coat, as in the conifers, they become fleshy on the outside, with a hard stone within, and are much like plums. The group is very fern-like, and probably has come from the ferns. One of the most recent and important discoveries in connection with the group is that their sperms are ciliated and can swim, as in the ferns. See GYMNOSPERMS.

Cy'clone, a phenomenon of the earth's atmosphere, which is practically always exhibited in any region of low barometer, that is, in any region where the pressure of the air has fallen considerably below its average. To understand the nature of a cyclone the student must bear in mind the fact that wind consists simply in the transport of air from regions of high pressure to regions of low pressure. In the northern hemisphere the air does not rush directly in toward the center of a region of low pressure, but sweeps around toward the center in more or less of a spiral, so that an observer, looking down upon a center of low pressure, would find the wind traveling in a direction opposite that of the hands of a watch. This vorticose motion of the wind is called a cyclone. These cyclones are generally many hundreds of miles in diameter. Now and then they become very small in diameter, and in these circumstances they are apt to be exceedingly destructive, and are called tornadoes. In America these cyclones travel with a speed ranging from 20 to 40 miles per hour. If now we consider a region of high pressure, it is evident that the wind must in general blow away from the center of this region. These winds also assume somewhat of a spiral form, as they do in the case of low-pressure areas: only here the direction of rotation is clockwise. This phenomenon is known as an *anticyclone.* In general the anticyclone is not marked with the same regularity of structure as the cyclone. In the southern hemisphere the direction of rotation of these two kinds of vortices is exactly the opposite of that found in the northern hemisphere.

Cym'bals are a pair of thin, round, metal plates, with a hollow part in the center, in which a leather strap is fastened for holding the hand. When struck one against the other, a loud, harsh sound is made. They were used in ancient times, by the Greeks, in the worship of the goddess Cybele. The best cymbals are made in Turkey and China. Attempts to discover the composition of the metal have failed. The cymbals generally play the same part as the bass-drum, and in orchestras they are played by the same performer, one cymbal being fixed on the drum, the other held in one hand, while the other hand wields the drumstick. Cymbals are mostly used in military music.

Cyme (*sīm*). A flat-topped cluster of flowers in which the inner flowers bloom first. See INFLORESCENCE.

Cy'press. Species of several genera of conifers. *Chamæcyparis* contains five species native to North America and Japan. They are all handsome trees, with the opposite scale-like leaves densely clothing the branches. The best-known species are the white cedar of the eastern United States, a tree 70 to 80 feet high; the yellow cedar of the northwest coast, a tree which reaches 120 feet in height; and Lawson's spruce of the Pacific coast, a magnificent tree which sometimes becomes over 200 feet high. *Cupressus* is a genus containing about ten species, found both in North America and the orient. They resemble the species of *Chamæcyparis* and are very ornamental evergreen trees, but are hardy only in California and the gulf-states. *Taxodium* contains three species, one in China, one

in Mexico, the third (*T. distichum*), the bald cypress, in southeastern United States. This last species grows in swamps and along rivers, is a large tree, often reaching 150 feet in height, and gives the name to the so-called cypress-swamps.

Cy'prus, an island of the Mediterranean, south of Asia Minor and west of Syria. It is about 140 miles long and 60 miles wide, and covers 3,584 square miles. There are two main ranges of mountains; the highest peak is Mt. Troödes, 6,352 feet above the sea. There are no harbors, rivers or lakes worthy of the name. It is governed by Great Britain by treaty (1878) with Turkey. The capital and seat of government is Nicosia (population, 16,052); the two chief ports are Larnaca and Limasol.

Cyprus was colonized very early by the Phœnicians and afterward by the Greeks. It came under the sway successively of the Egyptians, Persians, Macedonians and Romans. The Cypriotes were one of the first Gentile people to become Christians, and were visited by St. Paul. The island was afterward taken by the Saracens; by Richard I on his way to Syria during the third crusade; by Venice; and lastly by the Turks in 1570. In 1878 Cyprus was occupied by the British, with the understanding that it is to keep it until Batum, Kars and Erzerum are restored by Russia to Turkey.

Cyprus produces wheat, barley, cotton, silk, flax, tobacco, wool, oranges, olives, grapes, etc. and great quantities of wine. Cyprus was once noted for its copper-mines, and copper got its name from that of the island, but it is only mined now at one place. The forests have mostly disappeared. The great scourges of the country are locusts and goats. The Cypriotes are peaceable, orderly and easily ruled. They are healthy and well-grown; the men, as a rule, are handsome, but the women are rarely so. Modern Greek and Turkish are spoken on the island. Population, 274,108.

Cy'rus the Great, founder of the Persian empire, is first known to us from the record on the cuneiform, clay tablet-and-cylinder, which recounts his reign, his conquest and capture of Astyages, king of Media, in 549 B. C. At this time Cyrus was called king of Elam. Year after year was idly spent by Nabonidas, king of Babylonia, at Terma, a suburb of the capital, Babylon, while his son—doubtless Belshazzar—was with his army in Akkad (northern Babylonia). In 538 Cyrus, favored by a revolt of the tribes on the Persian Gulf, advanced on Babylon from the southeast, and, after giving battle to the army of Akkad, took Sippona and lastly Babylon "without fighting." Cyrus at once originated a friendly policy in religion. The nations who had been carried captive to Babylon, along with the Jews, were restored to their countries and allowed to take their gods with them. The empire of Crœsus in Lydia had been taken two years before; and Cyrus was now master of all Asia from the Mediterranean to the Hindu-Kush. The conqueror's hold over Asia Minor and Syria was much strengthened by his friendly relations with the Phœnicians and the Jews, who received the news of his triumphs with joy. After the great king had widened his dominions from the Arabian Desert and the Persian Gulf to the Black Sea, Caucusus and Caspian, he died in 529 B.C. Cyrus ranks high among Asiatic conquerors. He was a wise ruler, whose aim was to soften by kindness the harsh rule which his sword was constantly extending.

Cy'rus the Younger, the second son of the Persian king, Darius Nothus, was born in 424 B. C. He headed a conspiracy against his brother Artaxerxes Mnemon, who had succeeded to the throne in 404 B. C. The plot was discovered, and he was sentenced to death, but afterward pardoned and even restored to his office as satrap of Asia Minor. Here he planned a war against his brother, but hid his purpose till the last. In the spring of 401 B. C. he left Sardis at the head of 100,000 Asiatic and 13,000 Greek hired troops, under pretense of punishing the robbers of Pisidia. Artaxerxes, warned of his treachery, was ready to meet him. The battle was fought on the plains of Cunaxa. Cyrus was defeated and slain, although the Greeks fought with the greatest courage and even drove back that part of the enemy in front of them. Xenophon's *Anabasis* gives an account of the expedition. It showed that the Persian empire was a shell, and inspired Agesilaus and Alexander to assail it.

Cy'toplasm (in plants), the name applied to the general protoplasm of a cell as distinct from the nucleus. See CELL.

Czar (*zär*) or **Tsar,** the title of Russia's rulers while the nation was an empire. The word comes from an old Slav word *cesar*, which the Poles spelled as *czar*, meaning king or emperor. The Russians used the Latin word *imperator* to express the idea of emperor. The first independent Russian monarch to use the title was Ivan IV, "the Terrible," who was crowned at Moscow in 1547. The Empress of Russia was styled the Czarina. The following have been the czars and emperors of Russia, from the era of the election of Michael Romanoff. Czar Peter I was the first ruler who adopted, in 1721, the title of emperor.

HOUSE OF ROMANOFF—MALE LINE

Michael	1613	Ivan and Peter I	1682
Alexis	1645	Peter I	1689
Feodor	1676	Catherine I	1725
Peter II	1727		

HOUSE OF ROMANOFF—FEMALE LINE.

Anne	1730	Elizabeth	1741
Ivan VI	1740		

HOUSE OF ROMANOFF-HOLSTEIN.

Peter III	1762	Nicholas I	1825
Catherine II	1762	Alexander II	1855
Paul	1796	Alexander III	1881
Alexander I	1801	Nicholas II	1894

Czecho-Slovakia, the most promising and most firmly established of the independent states which were created out of the ruins of the Austro-Hungarian empire. The western half of the country is made up of Bohemia and Moravia, where the bulk of the inhabitants are Czechs. The eastern half comprises Slovakia and Ruthenia, which were formerly parts of Hungary. The Slovaks are closely related to the Czechs in race and language, but are separated from them by the Little Carpathian Mountains. The Ruthenians, who are also called Rusins or Little Russians, are Slavs more closely related to the Russians of the Ukraine. The Treaty of Versailles guaranteed local autonomy to the Ruthenians.

Czecho-Slovakia is a land of rich mineral deposits, especially iron, coal, copper, silver, and gold. The chief crops are grain, potatoes, beets and mustard. Parts of the country are also famous for manufactures, as Bohemia for its glassware and Moravia for its woolen goods. The chief cities are Prague, formerly the capital of the kingdom of Bohemia and now of Czecho-Slovakia, Pilsen, Brunn and pressburg.

During the World War a Czech army of about 100,000 men fought with the Russians. The independence of the new nation was recognized by Great Britain on August 3, 1918, and by the United States one month later. The relative ease with which the yoke of the Austrians was cast off, and the comparative firmness with which the new government was established, were largely due to the efforts of Professor Thomas G. Masaryk, under whose guidance a democratic constitution, providing equal suffrage for men and women, was adopted. Masaryk was elected the first president of the republic.

Czechs, (*cheks*) are the most westerly branch of the great Slavic family of nations. In the latter half of the 5th century A. D. the Czechs migrated from their lands in Carpathia, on the upper Vistula, to the country now known as Bohemia. As a result of the World War the Czechs helped form the Czecho-Slovak republic.

Czernowitz, (*cher'no-vits*), a provincial capital of Austria, stands 720 feet above the sea, near the Pruth River. Among its buildings are the palace of a Greek archbishop, his cathedral, the Armenian church, the synagogue, and the municipal theater. The university, founded in 1875, has about 50 professors, and lecturers and about 1,000 students. Population about 100,000, of whom 20,000 are Jews.

Czerny, (*cher'ne*), **George,** meaning Black George, leader of the Serbians in their struggles for independence, was born of poor parents, Dec. 21, 1766, near Kragujevatch, Servia. He was concerned in a rebellion against the Turks in 1787, and afterward became a cattle-dealer. In 1801 a detachment of janizaries broke into his house and plundered it. Black George fled, vowing vengeance. He managed soon to gather a band of discontented fellow-countrymen, and began a sort of guerrilla warfare against the Turks. In course of time his little band increased in numbers, and in 1804 he was able to capture the fortress of Schabaz. Later on he besieged Belgrade, and early in 1806 routed the Turks at the Rivers Drina and Morava. Secretly aided by Russia, he captured Belgrade in December of that year (1806). The treaty of Slobosje was extorted from the Ottomans two years later, after which Black George was elected governor by the people and recognized as prince of Serbia by the sultan. The Russians sustained the prince in his position till Napoleon's invasion of Russia in 1812, when he was perforce left to shift for himself. The Turks at once recommenced hostilities. They were successful, and Czerny was compelled to flee to Austria, where he lived for some time. Meanwhile the freedom of Serbia had been again secured through the leadership of Milosch Obrenowitch. When Czerny returned, in July, 1817, he was murdered at the instigation of the new leader, Prince Milosch.

D

D (*dē*), the fourth letter, is a vocal consonant. It is classed as a dental or hard palate sonant, because made by the point of the tongue against that palate or the front teeth, as in *day*, *fixedness*, *old*. When preceded by a surd in the same syllable, *d* sounds as *t*, as in *arched*, *hissed*, *looked*. It is silent in *handkerchief*, *handsome*, *windrow* and the first syllable of *Wednesday*. The Romans used D as a numeral (500) as well as a letter.

Dacca (*dăk'ȧ*), a city of Bengal proper, 150 miles northeast of Calcutta, on the north bank of the Buriganga. It occupies an area of eight square miles, and consists of a dull esplanade and one long street meeting at right angles, with a network of narrow, crooked lanes. It, however, has unusual advantages for inland navigation, as its position commands the principal waterways of the delta. About 1610 it became the seat of the Mohammedan government of Bengal, which rank it kept, with a short break, until 1704. In the 18th century it became celebrated for its muslins, and the English, French and Dutch had manufactures here. It has since declined (the population falling off from 200,000 in 1800 to 69,212 in 1872), until the last few years have revived its prosperity. Besides manufactures, Dacca has a college and good schools. The Dacca and Maimansingh state-railroad, opened in 1886, has helped its growth. Population, 85,000. Dacca also is a district in Bengal, watered by the Brahmaputra. Its population is close upon 10,000,000.

Dacia (*dā'shĭ-ȧ*), an ancient country of Europe, of uncertain limits, lying north of the Danube and south of the Carpathian Mountains. It comprised at least what now is the eastern part of Hungary, Transylvania, Moldavia and Wallachia. It was inhabited by an exceedingly warlike people of German origin, who held the Romans in check from 10 B. C. until 100 A. D. During the reign of Domitian the Romans were even obliged to pay tribute. In 106 A. D. Trajan reduced the country to a Roman province. The Romans held most of this territory until 274 A. D., when Aurelian abandoned it to be overrun in succession by the Goths, Huns, Gepidæ, Avars and Scythians.

Dædalus (*dēd'a-lus*), in Greek fable, an Athenian who personified the beginning of the arts of sculpture and architecture. He killed his nephew and pupil, who envied his growing skill, and had to flee to Crete, where he carved the well-known cow for Queen Pasiphaë and designed the famous labyrinth for King Minos in which to confine the minotaur. He was imprisoned but escaped, forming wings for himself and his son Icarus, with which to fly across the sea. He flew safely across the Ægean, but Icarus flew too near the sun, the heat of which melted the wax that fastened his wings to him, so that he fell and was drowned in that part of the sea which the ancients afterward called Icarian. At Cumæ, in Italy, Dædalus dedicated his wings to Apollo. Many early works of art were ascribed to him. Discoveries in Crete have made it probable that Dædalus was a real person.

Daffodil. See NARCISSUS.

Dagobert (*dăg'ô-bērt*), the name of several of the Merovingian kings of France. The best known is Dagobert I, who ruled France from 628 to 638. He was a vigorous monarch, but debauched in his private life His court almost equaled in magnificence that at Constantinople. His most noteworthy act was to revise and publish the old national statutes, known as the Salic and the Ripuarian laws.

Dagon (*dā'gŏn*), the national god of the Philistines, half-man and half-fish. He is mentioned in the Old Testament as having temples at Gaza and at Ashdod, and his worship probably existed in other parts of Palestine. It was at the temple of Dagon in Gaza that the Philistines offered a great sacrifice, when Samson, who had been delivered into their hands, was brought forth and pulled down the temple.

Daguerreotype. See PHOTOGRAPHY.

Dahlgren (*dăl'grĕn*), **John Adolph,** an American naval officer, was born at Philadelphia in 1809, and died in 1870. He early entered the navy as midshipman, and soon rose in rank. While employed in the ordnance-department from 1847 to 1857, he made a series of experiments in the construction of heavy shell guns, which resulted in

ADMIRAL DAHLGREN

the adoption of a new pattern, called the Dahlgren gun. It is a muzzle-loading, cast-iron, smooth-bore gun, with great thickness of metal at the breech. Many of these guns are still in the United States service. Dahlgren also invented a rifled cannon for naval warfare. He did good service in the Civil War, being appointed rear-admiral and having command of the South Atlantic squadron. In 1869 he took command of the Washington navy yard, which he had held before the war.

Dahlia (*däl'yȧ*). A genus of the composite family, containing some of the commonest garden-plants. All of the ordinary garden-forms are derived from a single variable species *D. variabilis*. The genus contains about ten species, which are mostly Mexican, a few occurring in Central and South America. As an illustration of the varieties which can be made from a single species, it may be said that over 3,000 different garden-varieties of *D. variabilis* have been named and published in catalogues.

Dahomey (*dä-hō'mā*), a French dependency since 1894 in western Africa on the upper Guinea coast, formerly a negro kingdom. It lies between the German colony of Togoland and the British territory of Lagos, and extends inland for about 130 miles. On the north it is bounded by the French military territory of the Niger. It is known to possess an area of 65,000 square miles, with 70 miles of seaboard. It is almost surrounded by hostile tribes, and the boundaries used to change with the king's changing fortunes in war. The main port is Whydah, from which a road extends to the capital, Abomey, a distance of 65 miles. Dense forests and dismal swamps cover about two thirds of this distance; then vast rolling plains rise for many miles in the direction of the Kong uplands. The Avon and Denham lagoons receive the rivers of the country, none of which, however, are important. Groves of oil-palms encircle each town, from which palm-oil is made in great quantities; while the rich soil yields all the wealth of tropical growth. Cotton-cloth is made, and weapons and tools are forged from native iron. The people are negroes, generally of small stature but robust and active. They are sociable, equally fond of dancing and of rum, but warlike and prone to theft. Fetish-worship prevails, the main gods being the snake-god, tree-gods, sea-gods and the thunder-gods. Human sacrifices are made to the sea-god. At Whydah is a temple to the snake-god, containing over a hundred sacred snakes. Annually, in October, are revived the grand "customs," when as many as 500 victims are sometimes sacrificed. The king, before his defeat by the French, was the most absolute of despots. Of his army of 10,000 soldiers, the best part consisted of Amazons, mighty and blood-thirsty women. Monster slave-hunts formerly occurred, but the slave-trade is now ruined. The Dahoman kingdom dated from the beginning of the 18th century, and reached the height of its power under Gezo, who reigned from 1818 to 1858. The seat of government is Porto Novo (19,000 inhabitants). Abomey, the old capital, about eight miles in circumference, has 15,000 people, and Whydah about 12,000. The population is estimated at 1,000,000. The imports amounted to $7,139,655 in 1910, and the exports to $3,576,470. Cottons, machinery, drink and tobacco were the principal imports; palm-nuts and palm-oil the leading exports. Income and outgo balanced in 1910 at 3,235,000 francs. An iron pier marks the port of Kotonu, about 125 miles of railway on the projected line to Chaoru being completed from that point, with a branch 20 miles long to Segborué and Whydah. Ultimately the line will reach the Niger. Another railroad is building along the Lagos frontier. Kotonu is connected with Abomey, the Niger and the Senegal by telegraph, 1,725 miles altogether, with 120 miles of telephone lines.

Dairy. See DAIRY-FACTORY, MILK and BUTTER.

Dairy-Factory. Dairying as a special business has been widely developed in America, during the latter half of the 19th century, through the use of the factory-system. The first factory was organized in New York in 1860; soon many others were started; and in 1866 in New York there were nearly 500 of them in operation, with a stock of cows worth over $10,000,000 and with farms covering about 1,000,000 acres. This industry soon spread over the country and into Canada, and was adopted in European countries as the American system of dairying. At first cheese alone was made, but soon butter was added; moreover, special factories for butter were introduced, called creameries. In the creamery the cream gathered from hundreds of cows is worked by one skillful butter-maker and commands a higher price than homemade butter. It is sent to great distances in cold-storage or refrigerator cars. Foreign buyers may have it on their tables within two weeks of churning. The dairy-interest has reached vast proportions in the United States and Canada; at least 1,500,000 farms, with 17,000,000 cows and 100,000,000 acres of land, are devoted to the various branches of the industry. In 1909 the milk-yield of the United States was 9,888 million pounds, while 311 million pounds of cheese and 627 million pounds of butter were produced.

Daisy, a familiar wild flower and member of the Composite family. Alice Dowd speaks of it as "one of the most successful flowers in the most successful of flower

families." The farmer often calls it a weed, thinking wrathfully of its "success." The white rays of the White Daisy or White Weed attract insects, and in the closely-packed flowers that form the center the visitors find a feast that invites them to linger. It is also known as the Common Daisy, Ox-Eye Daisy, Love-Me, Love-Me-Not and Marguerite. The Daisy is the national flower of Italy. The name Daisy means Day's Eye, the English daisy closing with the close of day. This is a near relation of our white daisy, but has a pinkish tinge. It is the "wee, modest, crimson-tippit flower" of which Burns sang. Our Purple Daisy, the so-called Late Purple Aster, has a wide range, from Massachusetts to Minnesota and southward to the Gulf. The Blue Spring Daisy or Robin's Plantain flowers from April to June, is distributed east of the Mississippi, and prefers moist ground, grassy fields, hills and banks. The little Michaelmas Daisy bears a wealth of lovely feathery bloom, which may last to December. The Pig-Stye Daisy or Dog-Fennel is in ill-repute, as its name suggests; a rank weed, the unpleasant odor is repulsive to insects generally with the exception of flies, its chief fertilizers. From the western clover fields the ox-eye has even crossed the Atlantic, and in Europe found itself in high favor—no longer a weed, but given place in stately gardens.

Dakota River rises in the northeastern part of North Dakota, and flows south through South Dakota. It empties into the Missouri about eight miles below Yankton. Its length is estimated at 800 miles.

Dakotas (*dȧ-kō'tȧs*), a tribe of Indians residing between the Rocky Mountains and the Mississippi. Their language is thought to be nearer the Mongolian than that of any other Indian family. It is said that they came eastward from the Pacific till they met the Algonquins, and were held in check by them at the Mississippi. One tribe, the Winnebagoes, fought their way through to Lake Michigan. Another tribe, the Arkansas, settled on the Ohio, but were driven down the Mississippi to the region that now bears their name. The other tribes of the family are the Assiniboin or Stone Sioux, the Dakotas proper or Sioux, the Missouris, Omahas, Poncas, Iowas, Osages, Kansas, Ottoes, Minnetarees and Crows. It is now asserted that the Sioux followed the buffalo westward from the Atlantic across the Mississippi. There are some 30,000 Dakotas.

D'Alembert (*dä'lon'bêr*), **Jean le Rond,** a distinguished French mathematician and dynamicist, born in 1717, died in 1783. He was the illegitimate son of a French artillery general, Destouches, and of Mme. de Tencin. Left on the steps of a church in Paris, he was sent, not to a foundling asylum, but to a small town near Amiens. His father, returning from foreign lands, rescued the boy, took him to Paris, and educated him at the Mazarin College. It was at this institution that he assumed the name D'Alembert. At the age of 20 he settled to his life-work, the study of geometry and dynamics. He published an enormous number of papers; but his *Treatise on Dynamics*, which he completed at the age of 26, transcends all his other work in importance. The greatest advance which we owe to him is the introduction of a method (known as D'Alembert's principle) by which any of the complex problems of dynamics may be reduced to a corresponding problem of statics. By this simplification he obtained the solution of many otherwise insoluble problems. D'Alembert's *Dynamics* has been translated into German in volume 106 of Ostwald's *Classics of the Exact Sciences*, where it may be had at small cost.

Dalhousie (*dȧl-hou'zĭ*), **James Andrew Broun-Ramsay, Marquis of,** was born at Midlothian, April 22, 1812. By the death of his elder brother he became Lord Ramsay, and on the death of his father he entered the house of peers as Earl of Dalhousie. He distinguished himself in Parliament, holding with credit many important posts, and in 1847 proceeded to India as the youngest governor-general ever appointed to that country. His course there was marked by energy and ability, and earned him the title of the greatest of Indian proconsuls. He carried out many reforms, opened the country by railroads, telegraphs, roads and canals, and added four kingdoms to the British possessions. At the end of eight years his health gave way and he returned to England. He died on December 19, 1860.

Dal'las, George Mifflin, an American statesman and diplomat, was born at Philadelphia in 1792, and died there in 1864. He began his career by traveling as private secretary with Albert Gallatin to St. Petersburg and Ghent, and then entered upon the practice of law. Besides holding city and state positions, he was United States district-attorney, senator, minister to Russia and England and vice-president under Polk from 1845 to 1849.

Dallas, a city of Texas, the capital of Dallas County, situated on Trinity River, about one mile below the mouth of the West Fork and 315 miles north of Galveston. It is an important insurance and financial center of the southwest, and has extensive railroad connection through the following lines: The Texas & Pacific, Houston & Texas Central, Missouri, Kansas & Texas, Rock Island, Texas & New Orleans, Cotton Belt, Trinity & Brazos Valley, Santa Fe and the Frisco; and also electric lines to Ft. Worth 32 miles west and to Sherman 64 miles north. Dallas has good public schools and other institutions

of learning, among which are the Texas Baptist University, St. Mary's Institute (an Episcopal college for women), Medical Department of Southwestern University, Medical Department of Baylor University, the Southern Methodist University and several academies and commercial colleges.

Among the important public buildings are Carnegie Library, Oriental Hotel, St. Paul's Sanitarium and the Baptist Memorial Sanitarium. Lying in a fine agricultural country, Dallas has a large trade in grain, cotton, hides, vehicles, farm and mill-machinery, saddlery and harness. It manufactures extensively cotton-gin machinery and presses, leather-goods, cotton-goods, cotton-oil products, candies, crackers, saddles, harness, buggies, furniture. It is the home of the state-fair of Texas, and has an abundant supply of good water and all modern city conveniences. Population, 92,104.

Dalles of Wisconsin, The, near Kilbourne, Columbia County, are a picturesque gorge with high vertical walls through which the Wisconsin River rushes after rains with great violence; but in dry seasons not so fast as to prevent its navigation by small steamboats. *Dalles* is a French name for the rocky gorges in which rivers sometimes for a portion of their course are confined, and flow at great speed.

Dalma'tia, formerly a province of Austria along the Mediterranean and now governed in part by Italy and in part by Jugo-Slavia. Dalmatia appeals to travelers by its picturesque scenery, being diversified by mountains and numerous small lakes and rivers. The highest mountain is Orjen, with an elevation of 6,235 feet. About one ninth of the land is arable; nearly half is in pasture; and woods occupy about one third. Cattle-rearing, seafaring and fisheries are the chief industries. Besides Dalmatians, the people are made up of Italians, Albanians, Germans and Jews. The Dalmatians are a fine race of men, bold and brave as seamen and soldiers, and formerly were the main support of the military power of Venice. The cities are almost all on the coast. Dalmatia once was a considerable kingdom; but after various attempts it was conquered by Rome in the time of Augustus. After the fall of the western empire, it passed successively into the hands of Goths, Slavonians, Venetians, French and Italians, and since 1814 it has formed part of Austria. In 1869–70 and again in 1881 Dalmatia was the scene of insurrections. The chief towns of the province are Zara, Spalato and Ragusa. Population, 593,784.

Dalton, John, an English chemist and natural philosopher, was born in 1766. He was appointed to the chair of mathematics at New College, Manchester, in 1793. He published notable essays and papers on scientific subjects, and also lectured in London. His atomic theory of chemical action, which he announced in 1808, gave him world-wide fame. Various academic honors were showered upon him, and the English government gave him a pension. He died on July 27, 1844.

Dalzell', John (1845–), American statesman and lawyer, was born in New York and educated at Yale, where he graduated in 1865, and two years later was admitted to the bar. He has since become widely known as a corporation and railroad lawyer, in the latter capacity acting for the Pennsylvania Railroad. In 1887 he was elected to the 50th Congress on the Republican ticket, and he has subsequently served in that assembly, usefully acting on committees of the House as well as in general legislation.

Damaraland. See GERMAN SOUTHWEST AFRICA.

Damas'cus, capital of the Turkish vilayet of Syria and the largest city of western Asia, is situated about 70 miles from Beirût on the Mediterranean, in the plain of Damascus, near the mouth of the gorge through which the Barada River forces itself into the plain. The city stands at an elevation of 2,260 feet above the sea level, and to the northwest rises Anti-Libanus, to a height of 3,840 feet, crowned by the Dome of Victory. Seen from this mountain, the city presents the form of a tennis-racquet, the suburb Meidan forming the handle, and the remainder of the city being formed on the seven canals, by which water is drawn off from the Barada. Two of these canals are the Abana and Pharpar of Scripture. (Damascus claims to be the world's oldest inhabited city). The old citadel, going back to 1219, the palace and the mosque built in the 8th century tower high above the city. There are, besides, 70 other mosques and more than 150 chapels for prayer and instruction. The religious communities occupy different quarters of the city; and embrace Christians, Jews and Mohammedans. The different industries also have each their separate quarter: the silversmith's, the saddler's, the shoemaker's, the Greek and the book-bazar. On either side of the narrow streets are the rows of arched niches, in which are the shops of the city. Each shopkeeper sits cross-legged, with his wares piled up around him, awaiting customers. Behind the mud-walls and mean entrances there are splendid houses, fitted often with barbaric splendor. One of the sights of Damascus is the procession to Mecca, called the Haj. On these festivals, for miles around, there is a sea of human beings, dressed in the brightest and most striking colors. Circassians and Afghans, Kurds and Kalmuks, Turkomans and Tecks and most of the various tribes and peoples of the east are represented in the brilliant procession.

A railroad to Medina, Arabia, one thousand miles long, was opened in 1908. The exports and imports are large. In the city there are about 5,000 hand-looms, and 10,000 workmen are employed in weaving silk, cotton and woolen fabrics, carpets and similar articles. Much is being done in education, especially by the Christians. Population, 350,000. See Parker's *Five Years in Damascus*. G. G. Smith's *Historical Geography of the Holy Land;* Baedeker, *Syria*.

Damask, a fabric originally manufactured at Damascus, from which it derives its name. It was made of silk and was distinguished by its ornamental woven figures of fruits, flowers, animals and landscapes. The term is now applied to stuffs made for table-covers, window-curtains and furniture-coverings, with patterns woven in the loom; but not to those in which the design is printed. There are silk, linen, woolen and cotton damasks, and some are of two materials, usually dyed in different colors. Brocades and figured velvets resemble damasks, but in them the pattern is raised; while in damask the surface is flat and the pattern is distinct on both sides of the cloth. Table-linen damask is the kind most largely made. There are manufactures of damask in Great Britain and in other parts of Europe.

Damien (*dä'myăn'*), **Father Joseph,** a young Belgian priest who, in 1873, devoted himself to the self-denying duties of spiritual guide to the lepers confined on the Hawaiian island of Molokai. He became physician of their souls and bodies, their magistrate, teacher, carpenter, gardener, cook and even grave-digger. He was later joined by another priest. For 12 years Father Damien escaped the disease; but in 1885 the malady appeared in him; but, though his doom was sealed, he continued unabated his heroic labors. (Born 1840, died 1889.)

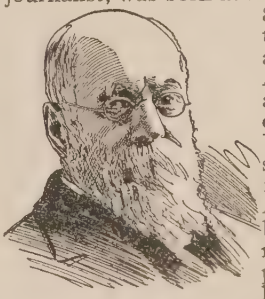
Damocles (*dam'ō-klēz*), one of the courtiers and flatterers of the elder Dionysius, tyrant of Syracuse. As Cicero tells the story, Damocles, having extolled in the highest terms the grandeur and happiness of royalty, was reproved in a singular way by Dionysius. Damocles was placed at a magnificent banquet, surrounded by all the splendor of royalty, and in the midst of his enjoyment, suddenly looking upward, he saw a naked sword hanging by a single horsehair above his head. The lesson taught him the uncertain nature of the happiness of kings.

Da'mon and **Pyth'ias,** two famous Pythagoreans of Syracuse, who lived early in the 4th century B. C., and whose names are always joined as the types of true and noble friendship. Pythias had been condemned to death by the elder Dionysius, tyrant of Syracuse, and was allowed to go home for the purpose of arranging his affairs, Damon pledging his own life for the appearance of his friend at the time appointed for his doom. True to his promise and in the midst of the greatest difficulties, Pythias returned just in time to save Damon from death. Struck by so noble an example of friendship, the tyrant pardoned Pythias and asked to be admitted into their sacred fellowship. It is said that not Pythias but Phintias, is the right name.

Damrosch (*dăm'rōsh*), **Leopold,** musical director, composer and solo violinist, was born at Posen, Prussia, Oct. 22, 1832; and died in New York city, Feb. 15, 1885. His professional career began in 1855, and by 1866 he had become musical director of a Breslau theatre, and in 1871, after coming to this country, leader of the Arion Society of New York. To him music-lovers are indebted for introducing German opera into America with great *éclat*, his concerts, operas and oratorios at the Metropolitan Opera House, New York, being hailed as musical events of the season. He also was director of the New York Oratorio and Symphony Societies of that city, both of which he founded and remained leader of until his death, at the comparatively early age of 53.

Damrosch, Walter Johannes (1862), American musician (son of Leopold), was born at Breslau, Silesia, and studied under his father and other musical experts. Coming to this country, the youthful musician in 1881 became conductor of the Harmonic Society of Newark, N. J. During his father's fatal illness in 1885 young Walter succeeded him as conductor of the Oratorio and Symphony Societies and as conductor of German opera at the Metropolitan Opera House, New York. In 1894 he organized the Damrosch Company, and for a number of years gave performances in German, French and Italian. Among his musical compositions are an opera founded on Hawthorne's *The Scarlet Letter*, a *Te Deum* in honor of Admiral Dewey's victory at Manila and several minor pieces.

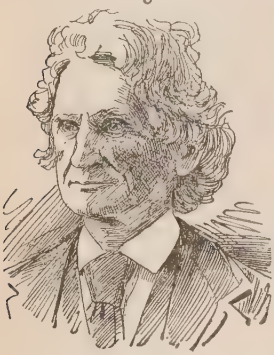
Da'na, Charles Anderson, an American journalist, was born at Hinsdale, N.H., Aug. 8, 1819. From 1848 to 1862 he was managing editor of the *New York Tribune*, and from 1863 to the close of the Civil War, was assistant-secretary of war. In 1867 he founded the *New York Sun*, and began the successful management of that paper on Democratic lines. Together with George Ripley, he planned and edited the *New American Cyclopædia* and its revised edition, *The*



CHARLES A. DANA

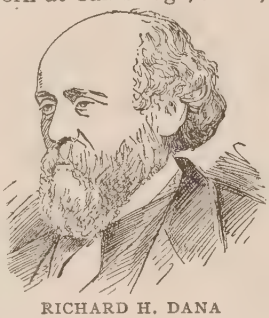
American Cyclopædia He died on Long Island, Oct. 17, 1897.

Dana, James Dwight, an American naturalist, was born at Utica, N. Y., Feb. 12, 1813. Graduating at Yale College, he was sent out in 1838 as a scientific observer in the United States exploring expedition under Wilkes, visiting the Antarctic and Pacific Oceans. During this expedition his ship was wrecked. He was for some time associate - editor of the *American Journal of Science*, and in 1846 became professor of natural history and geology in Yale. He gained world-wide distinction as a scientist. He published several works, among them *A Manual of Mineralogy* and a *Text-Book of Geology*. He died at New Haven, Conn., April 14, 1895.



JAMES D. DANA

Dana, Richard Henry, an American poet and essayist, was born at Cambridge, Mass., in 1787. After studying at Harvard, where he was concerned in a college-rebellion which prevented his graduation, he studied law. His tastes, however, were literary, and he soon became associate-editor of the *North American Review*. Some of his poems in this magazine, as *The Dying Raven* and *The Buccaneer*, were warmly praised on both sides of the Atlantic. But his best work was done in the field of criticism, and he did much to educate and elevate the literary taste of New England. For some time he published *The Idle Man*. He died at Boston in 1897.



RICHARD H. DANA

Dana, Richard Henry, Jr., an author and lawyer, was born in 1815. During his college-course he was compelled for a while to abandon his studies, because of a trouble with his eyes, and he shipped as a common sailor on a trip to California and back. This voyage he described in *Two Years Before the Mast*, the best book of the kind in the language. As a lawyer, he became distinguished and also did other literary work, including an edition of *Wheaton's International Law*. He died at Rome on Jan. 6, 1882.

Danaë (*dăn'āē*), according to Greek mythology, the daughter of Acrisius, king of Argos. The king confined her in a tower because it had been foretold that her son would kill him. Jupiter fell in love with her, and gained access to her room through the openings in the roof. She had a child by Jupiter, who was later called Perseus. Acrisius put her with her child into a chest, and the chest with its prisoners was thrown into the sea. The sea-goddesses conducted the chest safely to Seriphas, where Dictys took care of the wanderers and educated the child. Perseus finally fulfilled the prophecy by accidentally killing his grandfather.

Danaides (*da-nā'i-dēz*), in Greek story, the 50 daughters of Danaüs, who were married to the 50 sons of their uncle Ægyptus. Suspecting the sons of Ægyptus of treachery, Danaüs made his daughters promise to murder their husbands on their wedding-night. They all fulfilled this promise except Hypermnestra, who spared her husband, Lynceus. The Danaides were represented as condemned in Hades to pour water into sieves, in the vain endeavor to fill them.

Dan'bury, Conn., one of the capitals of Fairfield County, southwestern Connecticut, situated about 40 miles northwest of New Haven and 65 miles north-northeast of New York. It was settled in 1684, and was captured and burned by the British in 1777. Since then it has been noted for its manufacture chiefly of hats, being the first city to engage in this industry, and at present leading the U. S. Other manufactures are silver-plated goods, electrical goods and apparatus, art-metal ware, machinery, shirts, boots, shoes and sewing-machines. It has an excellent system of public schools, a state normal school, many beautiful churches, a public library and a city hospital. Population, 23,502.

Dan'delion. The common name of *Taraxacum officinale*, which belongs to the Composite family. It is a native of Europe and Asia, but has become naturalized throughout all temperate regions. Probably some of the Rocky Mountain forms are native. Its habit of persistent blooming and its characteristic globes of pappus are well known. Since it is prized for "greens" it has been cultivated and improved in Europe and in a few localities in this country. As a wild flower its distribution is general.

"Dear common flower that grow'st beside the way,
Fringing the dusty road with harmless gold."

It is a most persistent and hardy plant. Though the stem is short, the roots are long, the leaves so arranged that rain easily finds its way to the center and down to the roots. The stem is hollow, giving lightness and strength; the flower-head is made up of innumerable tiny flowers.

Bees, wasps, butterflies, beetles and flies—over a hundred insects—visit it for nectar and pollen. The seeming blossom of seed-time, the white, fluffy head, has given the plant the name of Blowball; and it is also called Peasant's Clock.

Dandolo (*dan'dō-lō*), a famous Venetian family, which gave four doges to the republic. The most illustrious of its members was Enrico, born about 1110. Eminent in learning, eloquence and knowledge of affairs, he ascended from one step to another until he was elected doge in 1192. As doge, Dandolo extended the bounds of the republic, fought and won many battles, marched at the head of the crusaders and subdued Constantinople. When the Emperor Alexius was murdered, Dandolo laid siege to Constantinople and took it by storm. He established there the empire of the Latins. He died at Constantinople in 1205. A later doge of Venice, Andrea Dandolo (1310-54), also achieved eminence.

Dane, Nathan, an American jurist, was born at Ipswich, Mass., Dec. 27, 1752, and died Feb. 15, 1835. A lawyer of high repute, he held many important public positions. But he is chiefly known through the Ordinance of 1787, which he drafted while a member of the Continental Congress. Dane also founded the Dane professorship of law in Harvard Law-School.

Dan'iel (a Hebrew word meaning God is judge) was a Hebrew prophet. According to the book which bears his name, he was descended from one of the highest families in Judah. As a youth he was carried captive to Babylon with three other Hebrew youths of rank. He and his companions were chosen for instruction in the language and literature of the Chaldeans, and the names of all four were changed—Daniel being called Belteshazzar; that is, prince of Bel. Not long after, he interpreted a dream for Nebuchadrezzar, and in consequence rose into high favor and was made governor of the province of Babylon and head-inspector of the priestly caste. This high position he kept under Darius and Cyrus, in spite of the intrigues of hostile courtiers At one time, because he refused to give up the worship of God, he was cast into a den of lions, but was preserved and reached still higher rank. He assisted his people in their return to their native land. The book of *Daniel* was written partly in Hebrew and partly in Aramaic, and is now divided into 12 chapters, the first half consisting of narratives and the second half of predictions. The predictions are in the form of visions, which tell the story of four successive empires, perhaps the Chaldean, Median, Persian and Macedonian, culminating in the eternal kingdom of Christ.

Daniell, John Frederic, a noted English scientist, was born at London, March 12, 1790, and died March 13, 1845. He devoted himself to chemistry and meteorology, and wrote a number of essays, besides an *Introduction to Chemical Philosophy*. He was professor of chemistry in King's College, London, and received many medals and honors for his valuable scientific labors. He invented the hygrometer, a new pyrometer and the voltaic battery known by his name.

Dante (*dăn'tē*), **Alighieri,** the great poet of Italy, was born in 1265, in a house in the Place of St. Martin at Florence, which is still pointed out. As with many other great men, a halo of legend surrounds his early life; but he himself, in his *New Life*, tells the earliest known facts. When only nine years old, he met the Beatrice of his later poems and formed a passion for her from which he never swerved. It, indeed, influenced the whole course of his life. Dante took part in the military and political affairs of his time, when the fierce conflicts of the Guelphs and Ghibellines were tearing Florence to pieces. He rose to high office and was sent on an embassy to the pope at Rome in 1301, when the victory of the more extreme party at home resulted in the banishment of the leaders of the opposite party, Dante included; and later they were condemned to be buried alive, if caught. The remainder of the poet's life was spent in exile. He traveled about a good deal, living in Verona, Tuscany, Romagna and, finally, Ravenna, where he died on September 14, 1321, and was buried. The great work of Dante is the *Divine Comedy*, made up of three parts, giving a vision of Hell, of Purgatory and of Heaven. In it Dante gives a complete view of the highest culture and knowledge of the age on philosophy, history, classical literature, physical science, morals and religion; all this is expressed in the noblest and most exquisite poetry. This work really made the Italian language, which before was rude and unformed. No work in the world probably, except the Bible, has given rise to so much literature. It was copied in 600 different manuscripts, and about 300 printed editions have been issued; it has been more than 300 times translated into foreign languages; and unnumbered introductions, essays and commentaries have been written on or about it. Dante had not been in his grave 20 years before Italy instinctively recognized that this was her great man. About 50 years after Dante's death a public lectureship on the *Divine Comedy* was established at Florence, to which Boccaccio was first appointed. Another of Dante's works is the *Banquet*. Dante, as Boccaccio relates, was of moderate stature, stooping when he walked, slow and dignified both in gait and speech, reserved and silent in habit; but, when he

spoke, keen and eloquent. He was devoted to music and painting. Boccaccio calls him "that singular splendor of the Italian race"; Carlyle: "the voice of ten silent centuries." See translations by Cary, Wright, Longfellow and Parsons-Norton. For life, character and works, see *A Shadow of Dante*, by Maria Francesca Rossetti.

Danton (*dăn'tŭn*), **Georges Jacques,** one of the great leaders in the French Revolution, was born at Arcis-sur-Aube, Oct. 28, 1759. A quiet, studious lawyer, practicing as an advocate in Paris, the fever of the times, however, soon filled his veins. Mirabeau quickly recognized his genius, and Danton became the leader of the populace. Along with Marat and Camille Desmoulins, he founded the Cordelier's Club, which soon became the rallying-point of all the hotter revolutionists. His harsh and daring countenance, his beetling black brows and voice of enormous power, thundering against the aristocrats, roused the people to fury. He became minister of justice, and for some time was the leading spirit of the Revolution. He roused the people of Paris to send forth armies to repel invaders from the soil of France. He probably had a share in the September murders in the prisons. He voted for the death of Louis XVI, and was a member of the committee of public safety. He succeeded in crushing the moderate party; but he could not restrain the forces he had created, and he himself at last fell a victim to the guillotine. The Mountain, as the ruling party was now called, saw a bloodier leader in the narrow and bitter Robespierre. When arrested, Danton showed no fear, but treated his judges with a contempt which hastened his doom. When asked his name before the bar of the tribunal, he replied: "My name is Danton, a name tolerably known in the Revolution; my abode will soon be annihilation; but I shall live in the Pantheon of history." He was guillotined on April 5, 1795. To the headsman he remarked: "Thou wilt show my head to the people; it is worth showing." See Carlyle's *French Revolution.*

Dantzic (*dant'zik*), formerly capital of West Prussia, but since 1918 a free city under the control of the League of Nations and forming part of Poland's corridor to the Baltic, four miles from the Vistula's mouth, in the Gulf of Dantzic, an inlet of the Baltic. Dantzic was an important town in the 10th century, and passed through various hands. Since 1793 it has been a city of Prussia, except during the time of Napoleon, when it existed as a separate dukedom. Several old churches and monasteries, with the town-hall and exchange, are the chief buildings. Dantzic was at one time a prominent member of the Hanseatic league, and is still one of the chief commerical cities of northern Europe. Besides its large trade by sea, river and railroad, there are many manufactures, including beer, sugar, tobacco, iron-works, etc. There is a library of 100,000 volumes. Population, 170,347.

Dan'ube, the second river of Europe, inferior only to the Volga. It is formed by the Brege and the Brigach, two mountain-streams rising in the Black Forest in Baden and uniting at Donaueschingen, 2,264 feet above sea level. At Ulm, the head of steam navigation, its elevation is about 1,500 feet; at Vienna 500 ; at Budapest 350; and at Moldova 200 feet. The Danube has a total length, including windings, of 1,740 miles, and drains an area estimated at 315,000 square miles. There are 400 tributaries, 100 of them navigable. There are three principal divisions of the river-basin. The upper course ends at Passau, where the river leaves German territory. At Passau its width is 231 yards and its depth 16 feet. The river then enters Austrian territory, and for some distance its scenery rivals that of the Rhine. It passes into Hungary southeast of Vienna, then making a sharp turn to the southward it enters Jugo-Slavia, after which it turns to the east and forms the boundary between Rumania and Bulgaria. Near Belgrade it broadens until it is 1706 yards wide.

Within a stretch of only seventy-five miles, beyond Ujpalanka are eight distinct rapids, shut in by lofty walls. The lower Klissura is the most strikingly picturesque of these; but the most difficult passage is the shortest (one and a half miles), the Iron Gate, below Orsova, where the middle course of the river ends. Here the stream has a breadth of only 129 yards, and the piled-up waters reach a depth of 28 fathoms; ledges of rock lift their tooth-like points above the surface; and all around a seething stretch of whirlpools, cataracts, eddies and counter-eddies combines with the river's rapid fall to present a serious and, formerly, impassable obstacle to navigation. Thence the lower course passes in a wide stream till it divides into the delta, through which it pours its waters into the Black Sea. The delta is a vast wilderness, covering an area of 1,000 square miles, and resembling an immense green sea of rushes; it is cut up by numerous channels and lakes, and is the haunt of sea-birds, wolves and buffaloes. The farthest mouths are 60 miles apart. The three main channels are the Kilia, St. George and Sulina. It is by the Sulina mouth that ships enter, although it discharges only two twenty-sevenths of the river's waters. The Danube is of great commercial importance. One company alone, which does a large business on its waters, has nearly 200 steamers and over 700 towboats. The Danube is connected with the Rhine by Ludwig's Canal, and with the Elbe by the Moldau, Mühl and other canals. Since 1856 the

Danube has been free to all nations. In that year was appointed the International Danube Navigation Commission, made up of delegates of all the great powers. It has almost absolute power over the mouths of the Danube and as far inland as the Iron Gate. It has already made many improvements. It has its own flag, uniform and revenue; has made laws; and keeps its own small army of police.

Danvers, Essex County, Mass., five miles from Salem on the Boston & Maine railway, has shoe, leather, incandescent lamp, brick, and rubber factories. St. John's Normal College, the Essex County Agricultural School, the Danvers State Insane Hospital, and the Page House (now occupied by the Danvers Historical Society and noted as an example of early Colonial architecture) are located here. The town also has a public library founded by George Peabody in 1852, good schools and miles of fine macadam roads shaded by magnificent elm trees. Population, 10,000.

Danville, Ill., like most of the towns in this state, is a flourishing center, and has an extensive trade in the mining and shipment of coal, taken from the contiguous bluffs. It is the capital of Vermilion County, and lies on the Vermilion River, 120 miles south of Chicago. It has a national soldiers' home, a high school, several churches, three national banks and daily newspapers, iron-foundries, planing-mills, carriage, wagon, organ and furniture-factories, together with the car and machine-shops of the Chicago, Danville & Vincennes Railroad. Its population has increased some 11,000 in the past decade, and now numbers 40,000.

Danville, Pa., a borough, the county-seat of Montaur County, on the northern branch of the Susquehanna River (with a bridge here spanning the stream), also on the Phila. & Reading and the D. L. & W. railways 41 miles southwest of Wilkes-Barre. It is the seat of the state hospital for the insane, has a good public library, and owns and operates its own water-works. In the neighborhood are coal, iron-ore and limestone deposits; while its industrial establishments embrace stove-works, rolling-mills and extensive blast-furnaces. Population, 7,517.

Danville, Va., a thriving town and important tobacco center in Pittsylvania County, southwestern Virginia, situated on the Dan River falls, 65 miles south of Lynchburg and 140 miles southwest of Richmond. It is at the junction of the Richmond, Danville and Norfolk Division of the Southern Railway and of the main line of the Danville and Western. The river furnishes power for cotton-mills, flour-mills, foundries and an electric-light "plant," and further development of its power has been made at a cost of $2,000,000. Danville is the largest loose-tobacco market in the world, having 150 tobacco-factories and manufacturing nearly 40,000,000 pounds of tobacco annually. It is the seat of Roanoke Female College (Baptist), Randolph-Macon Institute for young ladies (Methodist) and Danville Military School. Danville has a good public school system, churches, a general hospital and seven banks. Population, 19,020.

Daphne (*dăf'nē*) in the Greek myths was a river-nymph, the daughter of Gæa, goddess of the earth, and a river-god. In answer to her prayer to Zeus, Daphne was changed into a laurel, and so escaped the pursuit of Apollo, her wooer. Her lover, Leucippus, had been slain by the nymphs through the jealous wiles of Apollo. *Daphne* in the Greek means laurel.

Dardanelles (*där'dȧ-nĕlz'*), the ancient Hellespont, a narrow channel separating Europe from Asia and uniting the Sea of Marmora with the Ægean archipelago. The name is derived from the ancient city of Dardanus in the Troad. The trait has a length of about 45 miles, running from northeast to southwest, and a breadth of from one to four miles. From the Sea of Marmora a strong current runs through it. Both sides are strongly fortified. Since 1841 it has been agreed by the five great powers and Turkey that no ship of war belonging to any nation, save Turkey, should pass through the Dardanelles without the express consent of Turkey. Though nominally closed to the passage of foreign war-vessels, some modification of the prohibitory edict was in 1891 made by Turkey in favor of Russia. The Dardanelles are celebrated in ancient history by the passage of Xerxes in 480 B. C. to enter Europe and of Alexander in 334 B. C. to enter Asia. Both crossings took place near Abydos. See ABYDOS and BOSPORUS.

Dare, Virginia, the granddaughter of John White, whom Raleigh had sent in 1587 to found a settlement in Virginia, was the first child to be born of English parentage in America. The date of her birth was a few weeks after the expedition had landed, in the summer of 1587.

Darfur (*dähr-fōōr*) is a semi-independent Moslem state in Central Africa, bounded on the north by the Sahara, on the east by Egyptian Sudan and Kordofan, on the south by Bahr-el-Ghazai, on the southwest by French Congo and on the west by Wadai. It pays tribute to the Egyptian government, but its affairs are entirely within the control of its sultan for the present. Area, 170,000 square miles; capital, El Fasher; population, 1,500,000.

Da rien, Isthmus of. See PANAMA.

Dari'us, the name of three kings of Persia, the greatest of whom was Darius I, who ruled from 521 to 485 B. C. He was the son of Hystaspes, and succeeded to the Persian throne after putting to death the usurper Gaumata, who had given himself out to be

Smerdis, the brother of Cambyses, and had seized the throne. Accurate accounts of the reign of Darius are given by means of a monument of his time, the famous inscription on the rock of Behistun. For years he had to contend with revolts in various parts of his empire. Babylon revolted twice, and the first time it resisted him for nearly two years. He organized the Persian empire, removing the seat of government to Susa, and dividing his dominions into 120 satrapies. He did much to improve the internal administration, and encouraged commerce and the arts by useful institutions and laws. He pushed his conquests as far as the Caucasus and the Indus. In 508 he had an admiral explore the river. He made an expedition against the Scythians, crossing the Bosporus on a bridge of boats, and subdued Macedonia and Thrace He made two expeditions against Greece. In the first his fleet was wrecked at Mount Athos in 492, and in the second he was defeated at the battle of Marathon in 490. An Egyptian revolt also disturbed the latter years of his reign. Under Darius the Zoroastrian faith became the state-religion. Darius favored the Jews, and under him the second temple was built, being completed in the sixth year of his reign (515). He was succeeded by Xerxes.

Dar'ley, Felix O. C., a noted American artist, was born at Philadelphia, June 23, 1822, and died March 27, 1888 He early took to drawing with such success as to encourage him to devote himself entirely to art, especially in the form of book illustrations. Among his best known works are his outline drawings to Irving's *Legend of Sleepy Hollow* and *Rip Van Winkle* He illustrated Cooper's and Dickens' novels, with many other works Some of the finest figures and scenes on the government bonds and legal-tender notes were designed by him He also turned out some larger works After a foreign trip he brought out *Sketches Abroad with Pen and Pencil*

Dar'ling, Grace, a name famous in the annals of heroism, was the daughter of William Darling, lighthouse-keeper on Longstone, one of the Farne Islands, and was born at Bamborough, Nov. 24, 1815. On the morning of Sept. 7, 1838, a vessel was wrecked at Harker's Rock among the islands, and was seen by Grace Darling from the lighthouse, lying a wreck on the rocks. By wonderful strength and skill she and her father brought their boat to where the nine survivors were clinging, and within a few hours all were saved. The risk was great, and the feat required great daring. Grace Darling was loaded with honors and presents, but died soon after of consumption on Oct. 20, 1842.

Darling River, a tributary of Murray River, in Australia. It is formed by the union of several headwaters, all of which rise in the great dividing range. Its length, with its tributaries, is estimated at 1,160 miles, and the system thus formed drains an area of 198,000 square miles. It joins the Murray at Wentworth, on the borders between New South Wales and South Australia. Darling also is the name of a mountain-range and of two districts in Australia

Darmstadt (*därm'stät*), a city of Germany, capital of the grand-duchy of Hesse-Darmstadt, lies on the small River Darm, 15 miles south of Frankfort-on-Main. There are several public squares and five public gardens and promenades. Among other buildings there are two palaces. The old ducal palace contains museums of paintings, natural history, etc. In Prince Charles' palace is Holbein's famous *Meyer Madonna*. There are a good trade and a number of manufactures; but the town depends more on its ducal court and government offices than on its industries. Population, 87,085.

Darnley. See MARY, QUEEN OF SCOTS.

Darrah, Mrs. Lydia, a Quaker heroine of the Revolutionary War, residing in Philadelphia in 1777, during the British occupation From this patriot lady the English adjutant-general, the story goes, rented one of her rooms for a conference with his brother-officers; and, suspecting some plot against Washington's army, then near-by, Mrs Darrah, it seems, overheard an order dictated to attack Washington's troops at White Marsh on Dec. 4. The information gleaned enabled Mrs. Darrah to give warning of the projected attack, and that at a critical moment, with the result that Washington was prepared to meet the British design and entirely nullify its results

Dart'moor, a desolate upland in Devonshire, England, the source of all the principal rivers of the county. It is remarkable for its wild and rugged scenery, its trackless wastes and its mineral products. Its extreme length from north to south is 25 miles, and from east to west 20. The hills are called *tors*, and usually have crests of granite, worn by the weather into odd shapes. There are many rude stone-antiquities, earthworks and cyclopean bridges. The principal mineral products are tin and china-clay or kaolin Dartmoor is chiefly noted as the site of a prison, built in 1806, for the custody of French prisoners of war. On the breaking out of the War of 1812, 2,500 impressed sailors, claiming to be American citizens and refusing to fight against their country, were imprisoned here, and most of them kept until the end of the war. Accounts of their harsh treatment caused much bitter feeling in the United States. The prison inclosures occupy an area of 30 acres, encircled by a double line of lofty walls. The prison now is a convict-depôt.

Dart'mouth College. See HANOVER.

Dar'win, Charles Robert, one of the world's greatest naturalists, was born at Shrewsbury, England, Feb. 12, 1809. He studied at Edinburgh University and at Christ's College, Cambridge. Both Darwin's father and grandfather were naturalists, and he early became interested in the same line of study. At the close of 1831 he sailed as naturalist on the *Beagle*. On this voyage, which lasted five years, he gained a knowledge of the animals, plants and rocks of many countries, which equipped him for his future studies. His *Journal*, giving his observations while on the *Beagle*, was published in 1839. In the same year Darwin married and settled upon his country-estate. He devoted himself largely to the problem of the origin of species, the different kinds of animals and plants. This work he carried on in spite of distressing sickness. After five years' work "he allowed himself to speculate" on the subject, and drew up some short notes. He was a cautious student, and his conclusions were not published till 1859. That year his *Origin of Species* came out. It made such a stir in the intellectual world that it is in some ways the most important book of the 19th century. In it he attempts to explain the way in which species have been evolved through a process of *natural selection*, or survival of the fittest, in the struggle for existence. We should avoid the common error of supposing that Darwinism is the same thing as evolution. His theory of *natural selection* is merely one explanation of how the evolution of life was brought about. (See EVOLUTION.) The book was received with great interest throughout the world, and was violently attacked and defended, but to-day has become accepted in the main by theologians, scientific men and philosophers. Darwin published a number of other books. His kindliness of character, honesty of purpose, devotion to truth and attachment to his friends made him loved wherever known. He died on April 19, 1882. See his *Life and Letters*, by his son, Francis Darwin, who has become a great and famous astronomer. See also "The Debt of Science to Darwin" in *The Century Magazine*, Vol. XXV, 1883.

CHARLES ROBERT DARWIN

Date, the fruit of a well-known palm, *Phœnix dactylifera*, which is native to northern Africa and Arabia, and is more or less cultivated in other tropical and subtropical regions. It is one of the most common food-articles of the Arabs, and other parts of the plant furnish them with materials for various purposes. The tree becomes 100 feet high, having a straight, rough trunk, and is said to bear its enormous clusters of fruit for one or two centuries. The date-palm has been cultivated in the Spanish parts of North America for many years, but chiefly for decorative purposes. The only part of the United States suitable for growing the tree for commercial purposes is said to be southern Arizona and southern California, where some interesting experiments are being made and considerable success has already been attained. Dates rank very high as food, and are eaten both fresh and dried. In the date-palm staminate flowers are borne on one tree, pistillate ones on another. To insure perfect pollination the Arabs cut off sprays of staminate flowers and place them in the pistillate trees. The tree is propagated by seeds and by suckers; if a certain variety is desired, suckers are used; the date is like the apple in not growing true to seed.

DATE-PALM

D'Aubigne' (*dō-bēn-yā'*), **Jean Henri Merle,** the great Swiss historian of the Reformation and Evangelical divine, was born near Geneva, August 27, 1794; and died there, Oct. 20, 1872. He studied theology at Geneva and in Berlin, where he had Neander as his instructor, and for a time held pastoral charges at Hamburg and at Brussels, and at the latter city was preacher to the court. Returning to Geneva, he became professor of church-history in its theological seminary, and here wrote his famous *History of the Reformation in the Sixteenth Century*, his *History of the Reformation in Europe in the Time of Calvin* and works on Lutheranism and Christianity. His works on the Reformation have raised a monument to his name. They, however, are the work, not of a judge, but of an advocate.

Daubigny, Charles François (*frän-swä' dō'bēn'yē'*), a French etcher and landscape-painter, was born in 1817. He studied with his father, with Delaroche and with others, exhibited when only 21, but did not receive full recognition for 28 years He

devoted himself to close and sympathetic study of nature, working much from a house-boat on the Seine, and painted landscape with originality, naturalness and fidelity. He also became a vigorous etcher, frank in method and retaining the painter's freedom. The *Pool of Gylien* and the *Rising Moon* rank with his best pictures. He died in 1878.

Daudet (*dō'dā'*), **Alphonse,** a modern French novelist, was born at Nîmes, May 13, 1840. His first literary work was in the line of poetry, and he spent some years writing for the stage. To *Figaro* and other journals he contributed some of his best work. One of his most noted early works is *Tartarin of Tarascon*, a most amusing satire on the characteristics of the natives of the south of France, which he followed by a second part, *Tartarin on the Alps*. Many of his later works exhibit a rich pathos, as in *Jack*. His writings generally are vigorous and lively. He died at Paris, on Dec. 16, 1897.

ALPHONSE DAUDET

Daughters of the American Revolution, a patriotic society organized by and for women, Oct. 11, 1890, with headquarters in the City of Washington and to-day having a membership in the various chapters of the order throughout the states, territories and dependencies of the Union, as well as in England, Canada and South Africa. The design of the society is to perpetuate the memory of those who took part in achieving American independence, to collect and preserve relics of the historic era and to erect monuments of notable patriots on eligible historic sites. Membership in the society is restricted to "women who are lineal descendants of an ancestor who was a military, naval or marine officer, soldier, sailor or marine in actual service under the authority of any of the 13 colonies or states or of the Continental Congress and remained always loyal to such authority, or descendants of one who signed the Declaration of Independence, or one who, as a member of the Continental Congress or the congress of any of the colonies or states or as an officer appointed by or under the authority of any such representative bodies, actually assisted in the establishment of American independence by service rendered during the War of the Revolution, becoming thereby liable to conviction of treason against the government of Great Britain, but remained loyal to the authority of the colonies or states." The society is incorporated, publishes a monthly periodical, and, besides its headquarters at the national capital, has chapters throughout the country, with a total membership (1908) of over 40,500.

Dauphin (*da'fĭn*), the title given to the eldest son of the king of France, the heir-apparent to the throne. The title in this form originated with Humbert II, Lord of Viennois, in 1349. Humbert died childless, and transferred his possessions to Charles of Valois on condition that the heir-apparent to the throne of France bear the title of Dauphin of Viennois. Dauphin was a title earlier held by some of the feudal lords of France who wore dolphins upon their helmets, or used them as a family crest.

Davenport, a city of Iowa ranking third in the state in population, is located on the Mississippi, 183 miles west of Chicago. The site was formerly occupied by an Indian village, and was visited by Père Marquette and Louis Joliet in 1673. The city was incorporated in 1838, and the first school was established in the same year. The population, which was 1,848 in 1850, has now increased to over 48,000. Davenport is largely a manufacturing city, the capital invested in manufactures being $15,000,000, and the men employed 8,000. The value of the output in lumber, metal-wheels, railroad equipment, wagons, cigars, pearl-buttons and other manufactures now exceeds $18,000,000.

Davenport is at the western terminus of the Hennepin Canal, and is on six railways. It has all the institutions and agencies of the most advanced cities. Among the public institutions are Iowa Soldiers' Orphans' Home, C. C. Cook Home for the Friendless, St. Vincent's Orphanage and the Home for Old Farmers. A $75,000 public library has been erected through the munificence of Andrew Carnegie. The city has five semipublic libraries.

Davenport has five miles of river frontage and a model water-service with the largest filter-plant in the world. It is the see-city of the Roman Catholic and Episcopal denominations. The museum of the Academy of Sciences has the largest collection of relics of mound-builders extant. Its public-school system is up-to-date in every respect, and has a large enrollment. Other schools are St. Katharines Hall; St. Ambrose College; the Academy of the Immaculate Conception; and parochial and private schools.

Davenport forms with Rock Island and Moline a community of 110,000 people whose social interests and commercial advantages are like those of the citizens of one place.

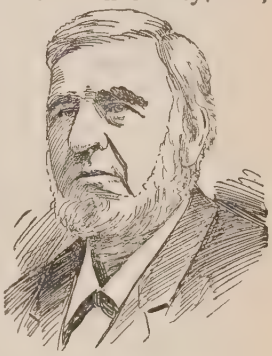
Da'vid, meaning beloved, the second king of Israel. He sprang from the family of Judah, and was the youngest son of Jesse. He is described as a handsome youth, "red-haired, with beautiful eyes and fair face," when he first distinguished himself in Israel

by slaying the Philistine giant, Goliath. Because of his heroic deed, or because of his skill with the harp, Saul took him to his court and gave him a military command. But the king became jealous of him, and he had to flee. In the cave of Adullam, near Gath, he gathered a band of 400 freebooters, which afterward increased to 600, with which he ranged through the country, never attacking the king or his countrymen, but always their enemies. He had difficulty in avoiding the king's expeditions sent against him, and finally left Judah, becoming vassal of the Philistine king of Gath. After the death of Saul and Jonathan, at Gilboa, David reigned seven and one-half years in Hebron over Judah, and on the death of Ishbosheth he was chosen king of all Israel. He conquered the independent city of Jebus (Jerusalem), and made it the center of his kingdom, building a palace for himself on the highest hill, Zion, and placing the ark of the covenant there under a tent. In the course of a few years the conquest of the Philistines, Moabites, Arameans, Edomites and Ammonites reduced the whole territory from Egypt to the Euphrates. In the last year of his long reign of 32 years in Jerusalem, there were popular troubles and two rebellions under his sons, Absalom and Adonijah He died between 1018 and 993 B. C. David is by far the greatest of the kings of Israel. He was courageous and skillful in war and prudent and far-seeing in government. He also was the greatest poet of his time, and the founder of the religious lyric poetry of the Hebrews — "the sweet singer of Israel."

David (*dā-vēd'*), **Jacques Louis,** a French painter, was born at Paris, Aug. 31, 1748. Before the Revolution he had produced many celebrated works, among them the *Oath of the Horatii* and *The Death of Socrates.* In the Revolution he took a prominent part; voted for the death of the king; was the artistic decorator of the great national fêtes of the Republic, which were founded on classical customs; and narrowly escaped with his life. When the Bourbons were restored, he was banished to Brussels, where he died, Dec. 29, 1825. His masterpiece, probably, is *The Rape of the Sabines.*

Davis, Cushman Kellogg, late United States senator for Minnesota, was born at Henderson, N. Y., June 16, 1838; and died at St. Paul, Minn., Nov. 27, 1900. Graduating at the University of Michigan, he studied law and practiced in Wisconsin, joining one of its infantry-regiments at the outbreak of the Civil War as lieutenant. In 1867 he was elected to the Minnesota legislature, and in 1868 became United States district-attorney for his state, and then governor (1874–75). In 1887 he took his seat in the United States senate, where he served until his death. He long served as chairman of the senate committee on foreign relations, one of whose acts was to declare war against Spain in 1898; and later was a member of the peace-commission to Paris. He was the author of *The Law in Shakespeare.*

Davis, David, an American jurist and statesman, was born in Cecil County, Md., March 9, 1815, and died at Bloomington, Ill., June 26, 1886. After graduating from Kenyon College, Ohio, he studied law in the east, and began practice in Bloomington, Ill., where he made his home. In 1844 he was a member of the state legislature, and four years later was appointed to the bench as judge of the eighth judicial district of Illinois. In 1862 President Lincoln, whose executor and intimate friend he had become, appointed him a justice of the United States supreme court. In 1877 he resigned to enter the United States senate, and in 1881 was chosen president of the chamber. Though nominally independent in politics, Judge Davis usually voted with the Democrats. In 1883 he resigned his seat in the senate, and died three years later.


JUDGE DAVID DAVIS

Davis, Henry Winter, American politician, was born at Annapolis, Md., Aug. 16, 1817; and died at Baltimore, Dec. 30, 1865. He practiced law in Virginia, and in 1854 was elected to Congress, where he served almost continuously till his death and was chairman of the committee on foreign affairs. He was a Republican in politics, and in 1860 was offered the nomination for the vice-presidency, but refused the honor. He strenuously advocated the emancipation of the slaves and the extension to them of the rights of suffrage.

Da'vis, Jefferson, was born in Christian (now Todd) County, Ky., June 3, 1808. He received an appointment from President Monroe to West Point, where he graduated in 1828. After serving in the Black Hawk War, he left the army and engaged in cotton-planting near Vicksburg, Miss. In 1845 he was elected to Congress, but resigned his seat the next year to take

JEFFERSON DAVIS

part in the Mexican War. As colonel of the First Mississippi Volunteers, he fought under General Taylor at Monterey and at Buena Vista, where he was wounded.

Mr. Davis was elected to the United States senate in 1847, resigning his seat in 1851. In 1853 he became secretary of war under President Pierce. In 1857 he again entered the senate, where he became a leader of the Democratic party and a champion of slavery and of state-sovereignty. He resigned his seat when Mississippi seceded from the Union, and was elected president of the Confederate States when that government was organized, Feb. 18, 1861. In 1862 he was re-elected to this office for a term of six years. By reason of his official position, as well as by his ability and force of character, his was the guiding hand in the long struggle. He was unwilling to give up when the cause had become hopeless. In his last message, dated March 13, 1865, he declared that, in spite of reverses, success might yet be secured. Lee surrendered at Appomattox in less than 30 days after this. On the approach of the Federal army Mr. Davis left Richmond, and, after a conference with Generals Johnston and Beauregard at Greensboro, N. C., he set out with an escort westward through Georgia. He was captured at Irwinville in that state, May 10, by a detachment of Federal soldiers under Lieutenant-Colonel Pritchard. He was confined at Fortress Monroe for two years, was indicted for treason in 1866, was admitted to bail May 13, 1867, but was never brought to trial. He lived in retirement until his death, at New Orleans, La., Dec. 6, 1889. In 1881 he published *The Rise and Fall of the Confederate Government.*

Davis, John Chandler Bancroft, American jurist and diplomat, was born at Worcester, Mass., Dec. 29, 1822. After graduating at Harvard, he studied law and began to practice in New York. Early in his career he was secretary of the United States legation at London, and acted as American correspondent of the London *Times.* In 1869 he became a member of the New York legislature. In the same year he was appointed assistant-secretary of state, and acted as agent of the government at the Geneva court of arbitration in the settlement of the *Alabama* claims. From 1874 to 1877 he was United States minister to Germany, and from 1878 to 1882 was judge in the United States court of claims. Latterly he has held the post of reporter for the United States supreme court. He has published *The Massachusetts Justice, Treaties of the United States* and numerous volumes of reports.

Davis, Rebecca Harding, American magazinist and novelist, was born at Washington, Pa., June 24, 1831. Her early life was spent in (West) Virginia, and her first notable story, which appeared in the *Atlantic Monthly,* in 1861, dealt with *Life in the Iron-Mills.* On her marriage to L Clark Davis, editor of the Philadelphia *Public Ledger,* she removed to the east and for a time was on the editorial staff of the New York *Tribune.* Her chief publications include *A Law Unto Herself; Kent Hampden;* and *Dr. Warwick's Daughter.* She died Sept 29 1910.

Davis, Richard Harding, American novelist and journalist, son of the preceding, was born at Philadelphia, April 18, 1864, and educated at Lehigh and Johns Hopkins Universities. He began life as a reporter and correspondent for New York newspapers, and in 1888 became connected with the New York *Sun,* to which he contributed his early stories. He traveled considerably, and was managing editor for a number of years of *Harper's Weekly.* His descriptive powers were excellent, as shown in his *Three Gringoes in Central America* and *The West from a Car-Window.* Others of his publications include *Gallagher and Other Stories; Our English Cousins; Cuba in War-Time; The Rulers of the Mediterranean;* and a book on the Boer War. He died April 11, 1916.

Davis Strait washes the western coast of Greenland, and joins Baffin's Bay to the Atlantic Ocean. At its narrowest point, just north of the Arctic circle, the Strait measures about 200 miles across. Ginnunga Gap, spoken of in the old Norse sagas, is now known to be Davis Strait.

Davitt, Michael, Irish journalist and, with Mr. Parnell, founder of the Irish Land-League, was born in 1846, in Mayo County, Ireland, of poor parents, who were evicted from their little homestead when Davitt was a youth. This seems to have given a sinister coloring to his entire life, for we find him connected with the Fenian brotherhood in 1865, and five years later he was tried for treason-felony and sentenced to penal servitude. Released in 1882, he was in the following year arrested for seditious speech and imprisoned, and when a prisoner in Portland convict-prison he was elected to Parliament, but disqualified by vote of the House of Commons. Subsequently, when released from imprisonment, he was again elected to Parliament, but was unseated on petition, and resigned in consequence of bankruptcy proceedings against him. Mr. Davitt traveled widely, and made a tour of the United States in behalf of the Irish Land-League, of which he has written a *Defense.* He also published *Life and Progress in Australia* and *Leaves from a Prison-Diary.* He died on May 31, 1906. He was the stormy petrel of Anglo-Irish politics, but a devoted patriot.

Da'vy, Sir Humphry, one of the greatest of chemists, was born Dec. 17, 1778, at Penzance, Cornwall, England, where his father was a wood-carver. At school he got a taste for story-telling and for making scientific experiments. At 19 he settled down to the study of chemistry, soon becoming an assistant at a scientific school at Clifton. Here he became acquainted with Coleridge and Southey, and engaged in experiments on the breathing of gases, which several times nearly cost him his life. At 22 he was made lecturer to the Royal Institution of London, where his eloquence and novel experiments soon drew large and brilliant audiences. His discoveries in agricultural chemistry were important, but his fame chiefly rests on his advanced views of the science, first made known in his lecture *On Some Chemical Agencies of Electricity.* Following out the principles laid down in this essay, he made the valuable discovery that the alkalies and earths are compound substances formed by oxygen combined with metals. It was potash that he first succeeded in decomposing. When he first saw the globules of the new metal, potassium, his delight was so great that he could not go on with the experiment. Davy was knighted in 1812; he was afterward made a baronet and president of the Royal Society. He discovered the talents of Faraday and obtained his appointment as assistant in the laboratory of the Royal Institution. In 1815 he began to study the nature of fire-damp, which is the cause of explosions in coal mines. This resulted in his invention of the safety-lamp, one of the most useful of modern inventions. Said the great naturalist Cuvier, at the time of Davy's death: "Davy, not yet 52 years old, occupied, in the opinion of all who could judge of such labors, the first rank among the chemists of any age." Davy died on May 29, 1829. See his *Memoirs*, by his brother, John Davy.

SIR HUMPHRY DAVY

Dawes (*daws*), **Henry Laurens,** United States senator, was born in Cummington, Mass., Oct. 30, 1816. After graduating from Yale, he taught school, became a lawyer, a newspaper editor and a member of the state legislature. He was member of Congress from 1857 until 1873, where he became one of the prominent men of the country. He was United States senator from Massachusetts from 1875 until 1893. Senator Dawes introduced most of the bills which were passed with a view to bettering the condition of the Indians; he introduced the measure to complete the Washington monument and the weather-bulletin measure, by which weather-reports from all parts of the country are gathered and thus storms can be foretold with something like certainty. He died on Feb. 5, 1903.

Dawson (*da'sŭn*), the principal city in the Klondike region and capital of the Yukon District of Canada. It is situated on the eastern bank of Yukon River, where it is joined by the Klondike. It sprang into existence in September of 1896 at the time of the rush for gold in the Klondike, and by 1900 it had a population estimated at 25,000. The present population is about 10,000. Aside from furs, gold-mining is the only industry. The rich deposits of gold in the vicinity have given it world-wide fame. The gold is found in the beds of rivers and creeks. The area of the gold-fields is thought to be more than 100,000 square miles. The yield in 1905-6 amounted to $6,539,000. Since 1896 the district has produced $100,000,000, and systematic scientific mining is only commencing. Dawson is reached by steamer to Skagway at the head of Lynn Canal, a deep inlet into the coast of Alaska. The White-Pass and Yukon Railway is 90 miles long. Dawson is connected by telegraph with Skagway.

Dawson, George Mercer, son of Sir J. W. Dawson and late director of the geology survey of Canada, was born at Pictou, Nova Scotia, Aug. 1, 1849; and died at Ottawa, March 2, 1901. He was educated at McGill University, Montreal, and at the Royal School of Mines, London. In 1875, he was appointed to the geological survey, and explored largely in the Canadian northwest, British Columbia and the Yukon region. Much of the result of his investigations has been published in the annual reports of the geological survey of Canada. His work included the first detailed account of the surface, geology and glacial phenomena of the northern part of the American continent west of the lakes.

Daw'son, Sir John William, Canadian geologist and naturalist, was born at Pictou, Nova Scotia, October, 1820. He studied at Edinburgh, and made careful researches into the natural history and geology of Nova Scotia and New Brunswick. His scientific papers and books, especially his *Acadian Geology*, made him well-known. His *Devonian and Carboniferous Flora of Eastern North America* told of the discovery of what is believed to be the lowest form of animal life, the *Eozoön Canadense*, as it is called. He was a member of many learned societies, and for many years was principal and chancellor of McGill University, Montreal. He retired in 1893, and died at Montreal on Nov. 19, 1899.

Dayton, a city and important railroad-center of Montgomery County, O., lies on

Miami River, at the mouth of Mad River. The Miami Canal, joining Lake Erie to the Ohio, runs through it, and the city is served by eight railroads. By population it is the fifth in rank of the cities of the state. The streets are broad, some of them 133 feet wide the houses handsome, and its large court-house is patterned after the Parthenon. Here is a national soldiers' home. The city has large water-power. It has manufactures of railroad-cars, cash-registers, cotton, woolen and iron-goods, oil, flour, paper and machinery and large limestone-quarries. It has many fine churches and other public buildings, and possesses good schools, a preparatory academy and high school and St. Mary's (Catholic) Institute for boys. Population, 116,577.

Dead-Letter Office, in the United States postal department, is the place where unclaimed letters are sent. After remaining a month in the office to which they are directed, the unclaimed or "dead" letters are sent to Washington, and opened in the dead-letter office. If the writer's address can be found, the letter is returned to him; if not, it is destroyed. In one year nearly 7,000,000 pieces of mail were received. Many had no state on the address, 3,000 had no address at all; $92,000 in cash and more than $3,000,000 in drafts were found in the letters. Thousands of magazines, illustrated papers, picture-cards and valentines were sent to hospitals.

Dead Sea, the name of a most remarkable lake in the southeast of Palestine, called in the Old Testament, the Salt Sea, Sea of the Plain or East Sea. It is 46 miles long, with a breadth of from 5 to 9 miles. Its surface, which is lower than that of any water known, is 1,292 feet below the level of the Mediterranean. The shape is that of a lengthened oval, with a promontory jutting into it on the southeast. The Dead Sea is fed by the Jordan on the north and by many other streams; but it seemingly has no outlet. The excess of water is held to be carried off by becoming vapor. The tall limestone-cliffs on the east and west, the muddy flat on the north and the low marsh on the south are all barren and dreary. On the north blackened trunks and branches of trees can be seen, incrusted with salt; while on the south is the remarkable ridge of rock-salt, seven miles long and 300 feet high, called the Ridge of Sodom. The proximity of lava-beds, pumice-stone, warm springs, sulphur and volcanic slag proves volcanic work at some time in the past. The long-held belief that the vapor given off by the lake was deathly is not founded on fact. Birds fly over and swim about on its surface. But the salt of the water is inimical to life, though some lower forms of sea-animals are found in it. The water of the Dead Sea has eight times as much salt as that of the ocean. In all lakes or ponds without an outflow the water becomes salty, its feeders all the time bringing in salt while none goes off in vapor, as the water does. The evaporation is great because of the great heat. Rain hardly ever falls; the water is nearly as blue as the Mediterranean; and, though its taste is extremely salty and disagreeable, a bath in it is refreshing. It is almost impossible for the bather to sink in it, however hard he may try. It was for a long time thought that the Dead Sea flowed over the former site of the cities of the plain (*Gen.* xix).

Deadwood, So. Dak., a city, the seat of Lawrence County, in the western part of the state and the center of the gold-mining region of the Black Hills. It is on the Burlington and Missouri River and the Fremont, Elkhorn and Missouri Valley railroads, 175 miles west of Pierre. Its industries, besides boiler-works, embrace machine-shops, lumber-mills, brick and lime-works and smelting-plants for the reduction of gold and other metals. Population, 3,653.

Deaf-Mutes. Persons who are born deaf or who lose their hearing at a very early age are usually dumb also. Children ordinarily hear sounds and then learn to imitate them; that is, they learn to repeat what they hear other persons say. It is in this way that all of us have learned to speak. But the deaf child hears nothing; cannot therefore repeat; and so remains dumb. Deafness is much more common than was supposed some years ago. It was only when the many schools now open began their useful work that the numbers of deaf-and-dumb began to appear. In the United States alone there are about fifty deaf-and-dumb schools with over 7,000 pupils. The largest school in Europe is in London; the largest in America and, probably, in the world is in New York. Owing, probably, to the better nursing of children and to greater knowledge of the disease of deafness, the number of deaf-mutes is growing less in proportion to the population, there now being only one deaf-mute to every 1,800 people. No attempt was made to teach these children of silence till the 15th century; no school was set up till the 18th century; and teaching could not be readily had for all till within the last 60 years. The principle on which the deaf are taught was discovered by Jerome Cardan, who was born in 1501. He said that, while writing is associated with speech and speech with thought, written characters and thoughts can be joined together without the go-between of sound and that the teaching of the deaf and dumb, though difficult, is possible. This is very familiar now. With us it is common for a man to teach himself to read a language, though he cannot pronounce it. Many can read French who do not and cannot speak it. Yet this idea of Cardan's was new to the world in the 16th century. The mental condition of the deaf-and-dumb is so entirely unlike that of any other of the ailing members of the human family that it is hard to be

understood. The blind can be talked with and read to, and are thus placed in direct touch with the world around them. The deaf know almost nothing, because they hear nothing. Speech tells them nothing, because they cannot hear; books teach them nothing, because they cannot read. The system of teaching by signs and the manual alphabet —in which the letters are formed by different positions of the hands and fingers—is not now used so much as the oral system. The sign-language, until people go out of their way to learn the language of one, keeps the deaf shut out from the world and shut up to each other. By the oral system, the child is taught to speak by seeing how his teacher speaks—to lip-read; that is, to read the speech of his teacher and others, as expressed on their lips. He learns to speak with all, not merely with the deaf; and books, literature and, through these facilities, the world are thrown open to him. Good work for the deaf-and-dumb has been done in the United States. The institutions are well-supported by grants from the states, and are usually well-managed. There also are missions and churches, in which the services are carried on in the sign-language, both in this country and in England.

Deák (*dâ'äk'*), **Francis,** was born in 1803, at Kehida, Hungary. He was chosen representative to the Hungarian diet in 1832, where he became leader of the Liberals. After the Hungarian revolution, in 1848, he became minister of justice in the national cabinet. He made every effort to ward off the war which followed, and when Kossuth came into power he resigned. In 1860 he was leader of the moderate party, and as such drew up the address to the emperor of Austria, Francis Joseph, who also was king of Hungary, demanding the constitution of 1848. This was refused; but in 1866, after Austria's losses in the war with Prussia, the demand was again preferred and this time was granted. To Deák, more than to any other man, is due the present dual government of the Austro-Hungarian empire, under which the Hungarians have practically as many rights and liberties as their old Austrian rulers. Deák died at Budapest on Jan. 29, 1876.

Deakin, Alfred, prime minister of Australia, and minister of external affairs, was born at Melbourne, Victoria, Aug. 3, 1856, and educated at Melbourne University. He entered the local legislature in 1879, and was successively minister of public works, solicitor-general, attorney-general, senior representative at the imperial conference in London (1887) and a member of the various conferences and conventions on Australian confederation. He has written a number of important works on irrigation in Australia, the United States, India and Egypt.

Dear'born, Fort, on Lake Michigan, at the mouth of the Chicago River, on the site of the city of Chicago, was built by the government in 1803 to overawe the neighboring Indians. When war was declared against the British, General Hull, then in command at Detroit, ordered the garrison of Fort Dearborn to abandon that post and proceed to Detroit. The departure was delayed, however, and when the retreat began, Aug. 15, 1812, the garrison of 75 men, including officers and 30 friendly Miami braves, with women and children (the families of the soldiers and settlers), was attacked by 500 Pottawatomies. The battle was a short one. At the first fire the Miamis ran, and the troops were soon cut to pieces. During the fight a young Indian savage crept unseen into a wagon, and tomahawked 12 of the children. When two thirds had been killed, the remainder surrendered. Captain Wells, the commander of the 30 Miamis, fought so bravely that, when at last overpowered and killed, the savages took out his heart and ate it, hoping by this means to become possessed of the courage and prowess of the heroic scout. Fort Dearborn was rebuilt in 1816, and was garrisoned most of the time till 1837. In 1857 it was torn down, all but one building, which stood until the great fire in 1871.

Dear'born, Henry, an American general, was born at Hampton, N. H., Feb. 23, 1751. He became a physician, and during his leisure studied military tactics. The day after the battle of Lexington, he marched with 60 men to the aid of the Americans and covered their retreat at Bunker Hill. He went with Arnold to Canada, and was taken prisoner at Quebec. He served as major under Gates at the capture of Burgoyne, and made a gallant charge with his regiment at the battle of Monmouth. He was twice a member of Congress, and for eight years was secretary of war under Jefferson. In 1812 he was appointed senior major-general in the United States army and commander of the northern department. In 1813 he captured York (Toronto) in Canada and Fort George at the mouth of Niagara River. Dearborn was also for two years minister to Portugal. He died at Roxbury, Mass., June 6, 1829.

Death Valley, a desert-valley in Inyo County, California, lying nearly northwest and southeast between the Paramint and Funeral Mountains. The name comes from the fact that a party of emigrants perished here in 1849. It is about 50 miles long and 35 wide. Its surface is about 250 feet below sea-level and is covered for the most part with a deposit of a white salt, mainly borax, that has been washed here from the surrounding mountains. The Amargosa River, usually a dry channel but now and then a raging torrent, drains into it a large desert tract of Nevada. The temperature remains for months near 120° F., and, as

the air is almost perfectly dry, all moisture evaporates rapidly. There is little vegetation except a few scrubby species of cactus and greasewood, and little animal life except crows, jack-rabbits, buzzards, horned-toads, rattlesnakes, mice and rats. The surrounding mountains are rich in ores and minerals, as silver, gold, copper and iron. Large quantities of borax are exported.

Deborah (*dĕb'o-rȧ*), the mother in Israel, a Hebrew prophetess, judged Israel under a palm-tree on Mount Ephraim. Through her patriotism the Hebrews were delivered from the yoke of the Canaanites, under which they had lain for 20 years. She joined several of the tribes of northern Israel under Barak (meaning lightning), who completely destroyed a great army of Canaanites at Taanach, in the plain of Esdraelon, on the brook Kishon. Sisera, the Canaanite leader, fled, and was murdered in his sleep by Jael. Then "the land had rest for 40 years." The song of Deborah (*Judges* v.) is one of joy over the deliverance of the nation. It is one of the finest gems of poetry in the Old Testament, and is held to be the oldest piece of writing in the Bible.

Decalogue (*dĕk'ȧ-lŏg*), meaning ten words, the ten commandments, which are placed before the collection of laws called the Book of the Covenant (*Ex.* xx. 22; xxiii. 33). They are also found in *Deut.* v. 1–21. These commandments were summed up in two by Christ.

Decapolis (*de-kap'ō-lis*), meaning ten cities, a district of eastern Palestine, containing the cities Damascus, Philadelphia, Raphana, Scythopolis, Gadara, Hippos, Dion, Pella, Galasa and Canatha. The cities were probably rebuilt and given certain privileges after the conquest of Syria by the Romans in 64 B. C., and at some time bound together in a confederation. The word is not used for the district after the first century.

Decatur, Ill., Mason County, a flourishing industrial city and agricultural market in central Illinois, has five railroads running into it. It lies on the Sangamon River and is 40 miles east of Springfield. It is a thoroughly modern city with electric railways, extensive water system and other civic conveniences. It has railroad shops, corn products mills, and factories making plumbing and lighting fixtures, soda fountains, coffins and burial clothes, paper bags, elevator and agricultural machinery, domestic water systems, fly killers, wire mats, and has three coal mines. James Millikin University with 1,100 students and a Catholic University for girls are located there. Population, 43,000.

Decatur, Stephen, was born at Sinnepuxent, Maryland, Jan. 5, 1779. At 19 he went to sea as a midshipman, saw some service against the French, and the next year became a lieutenant. He gained great distinction in the war with Tripoli (1801–05). His brilliant achievement of boarding and burning the captured *Philadelphia* in the harbor of Tripoli and then escaping under the fire of 141 guns was said by Nelson to be "the most daring act of the age." For this he was made captain in 1804. In the War of 1812 he captured the British frigate *Macedonian*, but afterward was surrounded by four British frigates and forced to surrender, after the loss of a fourth of his crew. In 1815 he punished the Algerians for their piracy and forced the dey to respect the American flag. The bey of Tunis and pasha of Tripoli were also made to pay damages for breaking their treaties with the United States. Decatur was killed in a duel with Commodore James Barron, March 22, 1820.

Dec'can, The, is the tableland which lies between the eastern and the western Ghats (Ghauts) in southern India. The name is at times applied to the whole of the peninsular portion of India; but more properly only to that part which lies between the Rivers Nerbudda and Krishna. The region is of historical interest. Here were fought many of the wars which secured the position of the British in India, especially those against Hyder Ali and the Mahrattas. The Mahrattas were robber-hordes whom the British only with the greatest difficulty subdued.

December (from Latin *decem*, ten), and so applied to the month called December (the 12th in our year), which was the tenth month of the year in the Roman calendar (the year with the Romans beginning in March). The Anglo-Saxons called it Yule month and midwinter month. In December the sun enters the tropic of Capricorn and passes the winter solstice.

Decemvirs (*dē-sĕm'vĕrz*), the ten men appointed to codify—that is, to arrange and make into a system—the Roman law, both public and private. Commissioners were first sent to Greece to study the Greek laws, and on their return (302 B. C.) ten patricians, with Appius Claudius at their head, were appointed to write out the laws. By the end of the next year the code was finished and set up in the Forum on ten tables of wood. The next year two more tables were added, from which the code was known as the laws of the Twelve Tables.

Decid'uous Habit. The habit of shedding leaves at the approach of winter or of a regular period of drouth. In our region nearly all the trees and shrubs have the deciduous habit, and are bare during the winter. These plants do not attempt to protect their leaves throughout the winter, as do the evergreens, but drop them and put out a fresh and larger crop at the beginning of the next season. The leaves do not fall off by ordinary decay or accident. They literally grow off, and little

furrows appear near the insertion of the petiole, which gradually deepen until the leaves hang on only by a slender woody fiber, which is sooner or later snapped by the wind.

Dec'lara'tion of Independence. Not till after the battle of Bunker Hill and the appointment of Washington as commander-in-chief of all the colonial forces, was the separation of the colonies from Great Britain generally and seriously considered, though North Carolina in May, 1775, had at the famous Mecklenburg convention cut itself off from all allegiance to the mother-country. In May of 1776 Washington wrote from the head of the army, then at New York: "A reconciliation with Great Britain is impossible. When I took command of the army, I abhorred the idea of independence; but I am now fully satisfied that nothing else will save us." Before this, Massachusetts, followed by South Carolina, Georgia and North Carolina, had instructed its delegates in the Continental Congress to vote for independence. In May, Virginia, followed by New Hampshire, New Jersey and Maryland, sent similar instructions to its delegates. On June 7 Richard Henry Lee, a delegate from Virginia, moved a resolution in Congress that "these united colonies are, and of right ought to be, free and independent states and that a plan of confederation be prepared and transmitted to the respective colonies for their consideration and approbation." This resolution was adopted on June 11. Two committees were appointed under it, one to prepare a declaration of independence and the other to prepare articles of union or confederation. The committee to prepare the Declaration of Independence consisted of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman and Robert R. Livingston. They reported on June 28, but a delay was caused by the delegates from New York and Pennsylvania not having received their instructions. It was passed on July 4, 1776, by the votes of all the colonies, each colony having one vote. The sessions of the Continental Congress were held and the Declaration signed in the old Pennsylvania statehouse, known afterward as Independence Hall in Philadelphia. Here still hangs the cracked and broken Liberty Bell which, after the first reading of the Declaration, was rung for over two hours, with the firing of cannon and the beating of drums. Twenty-three years before, this bell had been cast with the prophetic words inscribed on it: "Proclaim liberty throughout all the land, unto all the inhabitants thereof."

Dec'ora'tion Day, called in the eastern part of the country Memorial Day, is the day set apart for commemorating the services of the soldiers and sailors who lost their lives in the Civil War. Speeches and processions are made in their honor, and their graves visited and decorated with flowers. It is observed by north and south alike; and in most of the states on the same day — May 30.

De Cosmos, Amor, whose real name is Dennis E. Lennox, was born in Nova Scotia, went to Australia, and in 1859 came to British Columbia. He was the first citizen of the province to advocate responsible government and union with the Dominion. From December, 1872, to February, 1874, he was premier of the province.

Deer, a general name for a considerable variety of cud-chewing and hoofed animals, including the stag, elk, Virginia deer, wapiti and reindeer. Members of the group are found in all countries except Australia, Madagascar and South America. The deer have solid horns which serve to distinguish them from the hollow-horned oxen and antelopes. As a usual thing the antlers are carried only by the males, and they are shed and renewed annually. The female

VIRGINIA DEER

reindeer has antlers as well as the male, and, occasionally, in other forms antlers appear as rudiments in some individual females. When the antlers are renewed, they start as outgrowths from the frontal bone and are covered with soft hairy skin and richly provided with blood-vessels. The skin covers them till they attain their full size, and while it is present they are said to be "in the velvet." They grow with great rapidity, the large antlers of a stag being completely produced in ten weeks. As soon as they are full-grown, a ring is formed at the base which pinches off the blood-vessels, and the outer covering skin begins to shrivel and come off in strips, and it is still further worn off by

rubbing the antlers against trees. The red deer of Europe, commonly called the stag after it has reached an age of five years,

MOOSE

is the most abundant form. As its name implies, its coat is of a reddish hue, becoming more grayish in the winter. The young are spotted. This animal is about four feet high at the shoulders and seven feet long. In the buck the antlers project upward and outward, and a full-grown buck presents a fine appearance. Their senses of sight, smell and hearing are very acute, and they are timid and very fleet. In America the so-called Virginia deer and the wapiti are the most representative The Virginia deer is chestnut-red above and white underneath. It is lighter colored in winter. Deer attain a weight of 250 pounds. In autumn and winter they feed on buds, ferns, shoots and bark; in summer, on general herbage and pond-lilies. They come to drink about sunset. The Virginia deer is abundant in various wooded parts of the United States and Canada. It is most abundant in Maine, Vermont, northern Minnesota, Michigan and Wisconsin. It is called, also, white-tailed deer, from the snow-white of the under part of its long, bushy tail, which is held stiffly aloft, when the animal is frightened and running away, and is conspicuous for a long distance. Hunters sometimes call it the flag-tailed deer. The wapiti is often called the American elk, but the name elk belongs, properly, only to the moose. It is larger than the stag of Europe, being, when full-grown, eight feet long and about five feet high at the shoulders. At one time the wapiti was to be found everywhere in the United States, but is now uncommon except about the western tributaries of the Mississippi and in California and Oregon. In the latter places it is abundant. The antlers of the full-grown wapiti are four or five feet long, and three or four feet apart at the points. The moose or elk is the largest of the deer family, with broad muzzle, large nostrils, very long legs and broad flat antlers. The moose are wary and clever and among the most difficult game to approach. They are found from northern Maine to the Arctic regions and both in Europe and America. The extinct Irish elk was an allied species. Remains of the same are now found in peat-bogs of Ireland. When living, this great elk reared its antlers ten feet high, and they sometimes measured twelve feet from tip to tip. The reindeer is at home in Lapland, Finland, eastern Greenland and other northern countries. In Kamchatka reindeer are used as saddle-animals as well as for drawing sledges. The North American variety is commonly called the caribou The caribou exists in large numbers in Nova Scotia, New Brunswick and Labrador, as far north as Hudson Bay. The United States government is now trying to preserve the reindeer of Alaska, and has so far met with great success. Among other forms in the United States is the long-eared mule-deer, with antlers branching in twos and ears eight

CARIBOU

inches long. They live on elevated plateaus in Washington, Oregon and Idaho. See Caton: *The Antelope and Deer of America* (2d ed 1881) and Hornaday: *American Natural History* See, also, ELK, REINDEER and STAG.

Deerfield, Mass., a town of 2,209 inhabitants (1910), situated in Franklin County. It is at the junction of the Connecticut and Deerfield Rivers and about 33 miles from Springfield. The surrounding region is agricultural. In the town there is some manufacturing, mainly of pocket-books

There are a public library and a good high-school. South Deerfield, a village in the township, has some importance in history as the scene in colonial times of several conflicts with the Indians. Here, in 1675, occurred the Bloody Brook Massacre which is commemorated by a marble monument. In 1703 De Rouville with his French and Indians burned the place. In Old Deerfield there is a fine monument to the soldiers.

Defiance, Ohio, a city, the county seat of Defiance County, 50 miles southwest of Toledo. It is situated at the forks of the Maumee and Auglaize Rivers, on the Miami & Erie Canal and on the Wabash and Baltimore & Ohio railways. It is in a good farming and stock-raising region, and, besides flour-mills, has many important manufactures, machine-shops, wagon-works, steel barrels and cases and auto parts. It is the seat of Defiance College, and has a public library. Population, 7,327.

Defin'itive Nucleus (in plants), a peculiar cell of the embryo-sac of angiosperms, which gives rise to the endosperm. See EMBRYO-SAC.

Defoe (*dē fō'*), **Daniel,** famous as the author of *Robinson Crusoe*, was born at London, most likely in 1661, and was the son of a butcher. He at first intended to become a minister, but instead engaged in business. Little is known of his early life; but it seems he was with Monmouth's army and also in King William's army in 1688; later on, he traveled in France and Spain and became bankrupt; but afterward he paid all or most of his debts. Toward the close of William III's reign, he became noted as an able and busy writer of pamphlets in favor of the king's policy. His poem, *The True-born Englishman*, was written to apologize for the king's being a Dutchman, by showing that the English themselves were descended from various races. Defoe was a dissenter, and as such wrote his pamphlet, *The Shortest Way with Dissenters*. The house of commons ordered the book to be burned. Defoe was tried and sentenced to pay a fine, to stand thrice in the pillory and to be imprisoned during the queen's pleasure. He stood in the pillory on the last three days of July, 1703, in the midst of a mob of friends who protected him from insult and even drank his health. While in prison, he kept on writing, and founded his *Review*, at first a weekly. In August, 1704, he was let out of prison, through the efforts of Harley, whose fortunes he followed from that time on, serving him well as a writer of political pamphlets. In 1719 he issued the first volume of *Robinson Crusoe*, which at once leaped into that popularity which it will never cease to keep. Others of his books are *Captain Singleton*, a work of much brilliancy; *Memoirs of a Cavalier*, perhaps the most real and truthful of all historical romances, which the great Chatham accepted as genuine history; *The Fortunes of Moll Flanders;* and *A History of the Plague*. Defoe died on April 26, 1731. See *Lives*, by Minto, Chadwick and Lee.

Dehis'cence (in plants), the opening of a spore-vessel or seed-vessel to discharge spores or seeds. Almost all sporangia dehisce in some way to discharge their spores, and very many fruits dehisce to discharge their seeds.

De Kalb, John, Baron, was born in Alsace on June 29, 1721. He entered the French army, and rose to be brigadier-general. In 1768 he was sent to America on a secret mission by his government. With Lafayette he joined the American army under Washington, in 1777, with the rank of major-general. In 1780 he was sent to re-inforce General Lincoln, who was then besieged at Charleston, but failed to reach him in time. At the battle of Camden he was second in command to General Gates, and was at the head of the Maryland and Delaware troops. He held his ground till Cornwallis sent against him his whole force. During the last charge he fell pierced with 11 wounds. He died three days later, Aug. 19, 1780.

De Koven, Henry L. Reginald, American musical composer, was born at Middletown, N. H., April 3, 1859, and studied at Stuttgart and Florence. Returning to America, he for a time was a musical critic on New York periodicals, but soon began a career as composer of songs and operas. His chief compositions are *Robin Hood*, *Don Quixote*, *The Mandarin*, *The Highwayman*, *The Three Dragoons*. Died 1920.

Delacroix (*de-lä'krwä'*), **Eugène,** a French painter, chief of the romantic school, was born at Charenton-Saint-Maurice, near Paris, April 26, 1799. In 1822 he exhibited his first work, *Dante and Vergil*. Other paintings are *The Massacre of Scio* and *Blind Milton Dictating Paradise Lost*. He died at Paris on Aug. 13, 1863.

Delagoa Bay (*dĕl'ä-gō'ä bā*), a now important inlet on the southeast coast of Africa, in the Portuguese province of Lorenzo Marques. It is available for vessels of large tonnage. The Olifant or Limpopo River flows into it, north of the town of Lorenzo Marques. A railway runs inland for 57 miles through the colony, and is continued through the Transvaal, 290 miles distant, to Pretoria. The Beira railway has a length of 204 miles in the colony, and is continued from the British frontier to Bulawayo. The coast region is swampy and malarial. There is telegraphic communication with the Transvaal system. It is stated that Britain, in view of the situation of affairs in South Africa desires to purchase the Portuguese possessions in East Africa. Britain, it is under

stood, holding the right of pre-emption at least over Delagoa Bay and its fore-shore, which have become valuable since the acquisition of the Boer republics.

Deland', Margaret, American novelist was born at Alleghany, Pa., Feb. 23, 1857, and was educated at Pelham Priory, New Rochelle, N. Y. In 1880 she married and settled in Boston, Mass. Her first volume was one in verse, entitled *The Old Garden. John Ward, Preacher,* her earliest novel, made a hit by its vigor and keenness in tracing the influence of certain doctrinal beliefs current in church-circles and supposed to be a part of Christianity. This was followed, among others, by *The Story of a Child; Philip and his Wife, The Common Way; Old Chester Tales;*

Delaroche (*de-là'rôsh'*), **Hippolyte,** known as Paul, a French painter, was born at Paris, July 16, 1797. He first came into notice in 1824 by his pictures, *St. Vincent de Paul Preaching in the Presence of Louis XIII* and *Joan of Arc before Cardinal Beaufort.* Among his other paintings are *The Princes in the Tower* and *Cromwell Contemplating the Corpse of Charles I,* which is held to be one of the first historical paintings of modern times. Perhaps his greatest work is the series of paintings on the wall of the semicircular saloon of the *École des Beaux Arts* (School of Fine Arts). The painting comprises 74 figures, among them the greatest painters, sculptors and architects in all history. Delaroche died at Paris, Nov. 4, 1856.

Del'aware Bay separates New Jersey and Delaware. Where it flows by Cape May and Cape Henlopen and joins the Atlantic, it is 15 miles broad, It is about 60 miles in length, to the entrance of Delaware River, and its greatest breadth is from 25 to 30 miles. The main channel is from 35 to 75 feet deep, and the largest vessels can sail to Philadelphia. A large breakwater, built by the government at Cape Henlopen, affords a safe harbor.

Delaware, Ohio, a city, the seat of Delaware County, on the Whetstone River and on the Cleveland, Cincinnati, Chicago & St. Louis, the Columbus, Sandusky & Hocking and other railroads, 23 miles north of Columbus. It was incorporated in 1827, and in 1844 became the seat of the Ohio Wesleyan University of the Methodist Episcopal body. It has good churches, schools and a public library, and is noted for its mineral springs, which have remarkable medicinal properties. Its industries, besides railroad repair-shops, embrace foundries and clay-works, manufactures of chairs, carriages, gloves, woolens, flour, lumber and building-material. Population, 9,076.

Del'aware River is formed by the junction, on the boundary line of New York and Pennsylvania, of two small streams which flow from the Catskills. It separates those states till it reaches Kittatinny Mountain, about 70 miles distant, where it turns sharply southwest and separates Pennsylvania from New Jersey. Soon it passes through Delaware Water Gap, a gorge whose banks are rocks 1,000 and 1,200 feet high on either side. Easton and Trenton are passed, and tide-water is met 132 miles from the sea. Philadelphia is the head of navigation for the largest vessels. Just across the mile-wide channel is Camden. Forty miles below Philadelphia the river empties into Delaware Bay, after a course of 300 miles. The chief branches are the Lehigh and the Schuylkill. The river is connected with the Hudson by the Delaware and Hudson and Morris and Essex Canals.

Delaware, State of. This is the smallest state of the Union, except Rhode Island, being 93 miles long and from 9 to 38 broad, and covers 1,960 square miles. It lies between Delaware Bay and Maryland.

Surface. The most elevated ground in the state is behind Wilmington, and it forms the divide between Brandywine and Christiana Creeks. A fine rolling country is found in the extreme north where the Pennsylvania upland enters. A ridge which runs northwest and southeast through the state forms the watershed of Delaware and Chesapeake Bays, but follows the Atlantic coast-line. The rivers are small, but some are navigable.

Fisheries. The well-known Cypress-swamp, 50,000 acres in extent, is filled with game, and its salty inlets abound in the finest fish and oysters.

Climate. Delaware has a range of temperature between the severe extremes of New England and the heat of the south.

Agriculture. Products in the northern section consist of cereals, hay, wheat, corn, oats and sorghum; while the central and southern portion of the state is noted for its dairy-products as well as for its berries, grapes, melons, tomatoes—raised and canned—and especially its peaches. Some 10,000 carloads of peaches are shipped out yearly, besides the quantities sent by water or used in canneries and evaporating works.

Manufactures. The clays and kaolins of Wilmington are made into brick, terra-cotta and crockery. The shipyards, car-shops, powder-mills and bridge-works of Wilmington add largely to the other industries of the state. Chief among these are the manufacture of pumping and mining-apparatus, paper-making machinery and leather-goods, especially morocco.

Education. Delaware has good public schools, furnishes free text-books and maintains separate schools for its colored population and a state agricultural college for them at Dover. There are 14 acade-

mies, seminaries and high-schools; Delaware College at Newark (co-educational) has scientific and normal departments.

Government. The governor serves for four years, and has larger power in appointing to office than most governors, but has no veto-power. The state is practically out of debt. The townships are called hundreds, after an English custom older than King Alfred's time. Every county-jail still has its pillory and whipping-post. One sixteenth of the people are foreigners, and one sixth are colored. There are but three counties, and in view of the many marshes Randolph of Roanoke once said that the Delaware senators represented three counties at low tide and one county at high tide. The state is well-served with railroads. The Chesapeake and Delaware Canal, which joins the two bays at their necks, was finished in 1829. The capital is Dover, and the only large city is Wilmington (population, 87,411). The population of the state is 214,270, making it the smallest state in population except Wyoming and Nevada.

History. The first white settlers of Delaware were 32 Hollanders, who were all massacred by the Indians. In 1638 Peter Minuit was sent out by Queen Christina of Sweden, and built Fort Christina on the site of Wilmington, garrisoned with Swedes and Finns. The Dutch afterward won the province from the Swedes, and in turn were ousted by the English. The duke of York, who was proprietor both of Delaware and of New Amsterdam, granted Delaware to William Penn in 1682; but it never was considered a part of Pennsylvania. The colony took an earnest part in the Revolutionary War and suffered for its patriotism, for Lewes was bombarded and Newark and Wilmington captured by the British. Delaware was the first state to ratify the constitution. Though a slave-holding state, it did not secede during the Civil War. Delawareans are called The Blue Hen's Chickens, a nickname given their soldiers in the Revolutionary War, because of the saying of one of their officers that no cock was game unless it came from a blue hen.

Delaware or **De La Warr, Thomas West, Lord,** was appointed captain-general and first governor of Virginia in 1609. He reached the colony in the next year, with three ships. He found the colonists in despair because of scarcity of food and bad government, but by good management he made them orderly, contented and industrious. In 1611 ill-health sent him back to England. In 1618 the bad government under which the Virginians suffered turned their thoughts to Lord Delaware, and they urged him to become their governor. He set out to meet their wishes, but died on the voyage.

Delawares, a tribe of the great Algonquin family of Indians, were found by the whites in detached bands, under chiefs or sachems, dwelling on the Delaware River, and calling themselves Lenapes. The Dutch, the Swedes and the English all traded with them peaceably. William Penn bought large tracts of their lands. The Delawares claimed that they were cheated in this walking-treaty, as it was called, and at first were not going to remove. But the Pennsylvanians called on the Six Nations for help, who haughtily ordered the Delawares, as women, to retire. They at this time were composed of three clans, those of the Turtle, the Turkey and the Wolf. From this time they kept splitting into bands and changing their homes. The Ohio, Muskingum, Miami, parts of Canada, the White River of Missouri, the Red River and the Kansas were successively homes of the Delawares. Most of them now are on the Verdigris River, on lands bought from the Cherokees. The Delawares fought at Braddock's defeat, took part in the wars of Pontiac, helped the Miamis in the defeat of St. Clair in 1791, fought against the Sioux, and in the Civil War sent most of their warriers to join the north. The early Swedish settlers attempted to Christianize them; but the best work among them was done by the Moravians, beginning in 1741. In 1866 the United States government allowed them to become citizens, which they chose to do, their lands and money held by the government being divided among the members of the tribe. Tammany, the name adopted by the well-known political society of New York city, was an early Delaware chief. The Delawares now number about 1,000.

Delcassé (*dĕl-kăs-sā*), **Théophile,** former minister of foreign affairs, was born at Pamiers on Nov. 1, 1852, and began his career early. In 1889 he entered the French chamber, and in 1893 became under-secretary for the colonies, and in the following year colonial minister in the Dupuy cabinet. He was a consistent advocate of colonial expansion, and had charge of the Fashoda interests in the Méline cabinet in 1898 as minister of foreign affairs. He retained the latter post in the Waldeck-Rousseau ministry, under the presidency of Émile Loubet. Owing to differences with Germany over Morocco (*q. v.*) which threatened war he retired to private life in 1905.

Del'hi (*dĕl'ē*), the chief city of the Punjab, India, is situated on the Jumna River, 954 miles northwest of Calcutta. It is walled on three sides, has ten gates and stands on high ground. The city is joined to southern India by two railroads. Among the buildings stands foremost the famous palace of Shah Jehan, 3,200 feet long by 1,600 feet broad. In the heart of the city stands the great mosque, one of the finest

in India. The *Minar*, built in the 13th century, is a pillar 238 feet high, 47 feet through at the bottom and 9 feet at the top. It has a winding staircase, wreathed with inscriptions from Koran. Modern Delhi is noted for its broad streets, the chief of which is Silver Street. It has a large wheat-trade, and its bazars are famous for gold and silver-work, precious stones, shawls and other articles of luxury.

Delhi was the capital of the Afghan and, afterward, of the Mogul empire. It was taken by the British army in 1803, and on the coronation of George V, in Dec., 1911, the capital of India was changed from Calcutta to Delhi. Population, about 200,000, more than half of whom are Hindus.

De Long, George Washington, American explorer, was born at New York, Aug. 22, 1844. After graduating at the United States Naval Academy in 1865, he set out on a voyage to Greenland in 1873. He wished very much to engage in Arctic exploration, and in 1877 his wish was fulfilled. James Gordon Bennett bought and elaborately fitted out the *Jeannette*. It was placed under the authority and protection of the United States Navy, and, with De Long in command, sailed from San Francisco on July 8, 1879, through Bering Strait, in search of the north pole. On June 13, 1881, the *Jeannette* sank, crushed by ice. De Long, with some of the party, perished on the banks of the Lena, in Siberia, in October of that year.

Delos (*dē'lŏs*), an island in the Grecian archipelago, is the smallest of the Cyclades, covering little more than one square mile. According to the old Greek story, it first was a floating island, but was fixed to the bottom by Zeus, in order that it might become a safe-resting-place for the goddess Leto in giving birth to Apollo and Artemis. Delos very early had a great festival of Apollo, attended by Greeks from many nations. The Confederacy of Delos, with Athens at its head, which was formed in 477 B. C., was so called because its deputies met at the temple of Apollo in Delos, and it kept its treasure there. After 146 B. C., when Corinth fell, Delos became a center of business. Its traffic was so great that it is said 10,000 slaves changed hands in a single day. It was noted also for its palm-trees, besides its brass and brazen vessels. Delos was laid waste in the Mithradatic war (87 B. C.), and never recovered.

Delphi (*dĕl'fī*), an old Greek town in Phocis, celebrated chiefly for its famous oracle of Apollo. From the Delphian nobles were at first taken the chief magistrates and the priests of the temple, while the Pythia, or priestess who delivered the oracle, at first always a young maiden, but afterwards a woman not younger than 50, was usually chosen from some family of poor country-people. In the center of the temple was a small opening in the ground, out of which arose an intoxicating vapor. The Pythia, having breathed this, sat down upon the tripod or three-legged stool, which was placed over the aperture in the ground, and then delivered the oracle. The oracle was either given at first in verse or else handed over to a poet employed for that purpose. As the Delphic oracle became more and more celebrated, Delphi grew into a town of great wealth, famous not only in Greece but among neighboring nations. Here the Pythian games were held, and it was one of the two places of meeting of the Amphictyonic Council. The fourth temple—the first to be built of stone—was destroyed by fire in 548 B. C., and during the next century the fifth and last was built by the Amphictyons at a cost of 300 talents or $575,000. It was faced with Parian marble and adorned with statues by the greatest living Greek sculptors. In 480 B. C., Xerxes sent a part of his army to plunder the temple; but as they climbed the rugged path that led to the shrine, a peal of thunder broke overhead and two huge crags, tumbling from the heights, crushed many of the Persians to death, while their comrades, struck with terror, turned and fled. It was, however, plundered afterward, and by Nero and by Constantine among others. In the time of Pliny there were 3,000 statues in Delphi, and within the temple for a long time stood a golden statue of Apollo.

Delta (*del'tä*) is a deposit formed at the mouth of a river from soil and other matter carried down in the stream or rolled forward upon the river bed. The name was first given to the tract of land thus formed by the Nile, which is in the shape of a triangle and resembles the Greek letter *delta* (Δ). More or less sediment is carried down by all rivers; but the forming of a delta depends upon there being no currents at the mouth of the river to sweep the sediment out to sea.

Deluge (meaning flood). By the deluge is usually meant the flood of Noah, the account of which is given in *Genesis* vi-ix. Stories of a great flood, agreeing more or less with the narrative given in the Bible, are common to most races. The Hindu story represents the god Vishnu as warning the prince Satyavarata of the coming of the flood, and furnishing him with a large vessel in which he and seven others, with their wives, were saved. The Chaldean Noah is called Xisuthrus, who sails in a ship guided by a steersman. The flood is seven days at its height, and Xisuthrus sends out first a raven, then a dove and lastly a swallow.

De Mille (*dē-mĭl'*), **James,** Canadian novelist, was born at St. John, New Brunswick, in 1837, and died at Halifax, Nova

Scotia, in Jan., 1880, where he held the post of professor of history and rhetoric in Dalhousie College. Besides a number of books for boys, he wrote *Helena's Household*, a tale of Rome in the first century; *The Dodge Club*, a story of a party of Americans traveling in Italy; *The Living Link;* and other works.

De Monts, Pierre du Guast, Sieur, was the companion of Champlain in 1604, a Calvinist and patentee under the king of the country of Acadié, which he sailed from France to colonize. They wintered on the island of St. Croix, where they suffered greatly from illness and cold, explored the Atlantic coast as far south as Cape Cod the following summer, and returned to France. De Monts was also patron of the colony on the St. Lawrence in 1608.

Demosthenes (*dē-mŏs'thē-nēz*), the greatest orator of Athens and Greece, was born about 383 B. C. His father died when he was seven years old, leaving him well-off; but his guardians cheated him out of his property. When he came of age, he brought suit against them. Most of the property was lost, but the suit was useful to Demosthenes; it forced him to study law, gave him the doggedness and strength of will that marked him through life, and by making him poor drove him to the pursuit of law as a means of livelihood. At Athens the parties to a suit were made to plead their cause themselves; but they often had their speeches written by a speech-writer. Demosthenes became a speech-writer, and soon had a large practice. By the time he was 30, he was rich enough to devote the remainder of his life to politics. At this time danger threatened Greece from the north—from Macedonia, a country which the Greeks thought half-savage and held of no account in Greek politics, but which, in the lifetime of Demosthenes, destroyed the liberties of Greece. Demosthenes' fame as a statesman rests on the fact that from the outset he foresaw the danger threatened by Philip of Macedon. Had his advice been adopted, Athens and Greece might have been saved. He wanted the rich to allow themselves to be taxed for war-purposes, the poor to agree that less public money should be spent on the great national festivals, and that rich and poor alike should serve in the army, instead of employing hired soldiers. Demosthenes failed to convince his fellow Athenians, and only when it was too late was his policy adopted. When Philip attacked the state of Olynthus, the orator delivered his speeches known as the *Olynthiacs*, which with the orations against Philip, the *Philippics*, are the greatest efforts of Demosthenes. During the next few years (346–340), he was engaged in forming an anti-Macedonian party, but the fatal battle of Cheronea (338), in which Philip completely triumphed, put an end to these efforts. In 330 he made his famous speech *On the Crown*, which was a defense of his whole political career. In 324 the treasurer of Alexander the Great decamped to Athens with a large sum of money. This money was placed in the state-treasury in charge of Demosthenes and others, and when Alexander demanded it, half of it was missing. Demosthenes was accused and condemned, but escaped into exile. He was not guilty of the theft, but was condemned by his political enemies. When Alexander died, Demosthenes was recalled from exile to lead an attempt to throw off the Macedonian yoke. The battle of Crannon put an end to the revolt. Demosthenes fled, and, on being captured, poisoned himself, 322 B. C.

As a boy Demosthenes was nervous, timid and rather girlish, and his mother allowed him to shirk the gymnastic training and out-door-life in which all young Athenians took part. He further was troubled with hesitation in speaking and with shortness of breath, but his will-power overcame all these weaknesses. It is said that he forced himself to speak with a pebble in his mouth; and, to get used to talking amid the noise of the popular assembly, he would speak as he walked up and down the seashore with the waves roaring in his ears as they beat upon the rock. His hard work and great capacity for taking pains are seen in the high finish of his speeches, as distinguished above those of every orator. The dignity, pathos, might, majesty and power of his speeches rank them with those of any orator that has ever lived.

Dena'rius (Latin *deni*, ten each; from *decem*, ten), the chief Roman silver coin, first minted as early as 269 B. C. and equal in value to ten of the copper coins called *as*. As the latter became reduced in size and value, the *Denarius* in the second century, B. C. equalled about 16 of the copper or bronze coins known as *as;* though finally the silver coin dropped out of use about the third century of our era. In Nero's time the *denarius* had a value, in English money, ranging from 7½d to 9½d or about 17 cents of our decimal currency. It is the coin referred to as a penny in the New Testament.

Denis, Saint, the patron-saint of France, was sent from Rome about 250 A. D. to preach the Gospel to the Gauls. At Paris he made many converts. The Roman governor of this part of Gaul ordered Denis, with two other Christians, to be brought before him. As they kept firm in their faith in spite of threats, they were cruelly tortured and afterward beheaded. It is stated that the bodies of the three martyrs were thrown into the Seine, but were recovered and buried by a Christian woman. In 636 King Dagobert founded on the site

of their graves an abbey, called St. Denis, which soon grew to be one of the richest and most important in the whole kingdom, and was long the burial-place of the French kings. For a long time the saint's name was the war-cry of the French soldiers, who charged with the cry: "Montjoye Saint Denys!"

Denison, Tex., a town in Grayson County and near the Red River in north-central Texas, on the Mo.. Kans. & Texas and the Houston & Texas Central railways. It has considerable trade in fruits and agricultural products and a number of manufacturing establishments, including railway machine-shops. St. Xavier convent is situated here, and besides good public schools there also is a business-college. Denison erected the first public-school building in Texas. Population, 13,632.

Den'mark, the smallest of the three Scandinavian kingdoms, consists of the peninsula of Jutland and a group of islands in the Baltic. Besides Denmark proper, under the rule of the Danish king, are now the Faroe Islands, Iceland, Greenland and the Danish West Indies of St. Thomas, St. Croix and St. John. The area of Denmark proper is 15,592 square miles; that of Iceland, Greenland and the West Indies 86,634 square miles, with a total population of 2,775,076. Denmark is separated from Norway on the north by the great, broad arm of the North Sea known as the Skager Rack, from Sweden on the east by the Sound and the Cattegat, and on the south it is bounded by Germany.

Surface and Drainage. The greater part of Denmark proper is low, the highest point being less than 600 feet above the sea. The coast is usually flat, skirted by sand-ridges and shallow lagoons. On the east coast are many bays useful for navigation and valuable for their fisheries, and there are many good harbors. There are no rivers though the canals are important.

Climate. Mists and sea-fogs are frequent, and rain, snow or hail on an average 150 days in a year. In the spring a cold, dry wind, called the *skai*, whirls clouds of fine sand from the coast inland, doing great damage to the crops.

Natural Resources. The commonest tree is the beech, which nowhere flourishes as it does in Denmark, though 300 years ago, the now rare oak was the great Danish tree. Denmark is poor in minerals. Peat from the many bogs, brown coal or lignite and seaweed take the place of wood as fuel. The value of the fisheries in one year exceeded 10 million dollars.

Agriculture. About 80 per cent. of Denmark is good soil, and nearly half the people are farmers. The land for the most part is parceled out into small holdings. The main crops are oats, barley and rye; wheat, flax, hemp, potatoes, butter and bacon are other leading products. Cattle, horses, sheep and goats are raised in sufficient numbers for exportation.

Manufactures. While Danish manufactures are not of great importance, the state in 1910 had 28 distilleries, whose brandy-output was 3,300,699 gallons. Other important manufactures are beer, beet-sugar and oleomargarine.

Education. The people are well-educated. Parents are compelled to send their children to school between the ages of 7 and 14 years. There are over 3,000 elementary schools, with 370,000 pupils, beside 80 high, 31 Latin and 19 agricultural schools. There are a Royal Academy of Arts, having 10 teachers and 300 pupils, and a Polytechnic Institution with a faculty numbering 40 and 600 students. The University of Copenhagen has 95 professors and about 2,000 students, and there are numerous colleges and other advanced schools.

Government and Religion. The established religion, to which the king must belong, is Lutheranism. Denmark is a constitutional monarchy, the king having a cabinet of eight ministers. The king was chosen by the people until 1660, when people and clergy, driven by hatred of the nobles, gave the king absolute power and made the crown hereditary. A constitution was afterward granted to the nation. The present form of government was adopted in 1849. The national legislature or *rigsdag*, consists of the upper house or *landsthing* and the lower house or *folkething*, which is chosen by the people.

Army and Revenue. The army numbers some 14,000; the war-strength is 50,000; and the navy, which is small and chiefly engaged in coast defense, comprises three monitors, three torpedo-gunboats and seven torpedo-boats. The revenue about equals the expenditure—about 100 million kroners annually. (The nominal value of the kroner is 25 cents.) The state in 1911 had about 2,120 English miles of railway, 1,212 miles of which it owned; 7,979 miles of telegraph lines, and 255,141 miles of telephonic wires.

History. Denmark's history goes back to the dim twilight of the saga-period, out of which loom the figures of its heroes, their brave deeds and daring voyages. Here the Celts first had their home, and from these shores the Angles and Saxons set sail in the fifth century to conquer England; while in their place the Danes of Zealand settled on the deserted lands. The missionary Ansgar baptized a Danish king as a Christian in 826, but their being Christians did not hinder the Danes from making their usual inroads into the territory of the Franks or check the piratical voyages of the famous vikings. Gorm the

Old, who first united the islands and the mainland under one rule, opposed Christianity; but Canute, his grandson, the conqueror of England, was its zealous friend. During the reigns following that of Canute, the nobles grew powerful by means of the feudal system and ground down the once free people to serfs. Waldemar I (1157–1182) conquered Norway; while Waldemar II conquered German lands, which were lost under his successors. The great Queen Margaret (1375–1412) ruled Denmark, Norway and Sweden so well that for once the three rival Scandinavian kingdoms lived together quietly and peaceably. Christian I (1448–81), the founder of the Oldenburg line of kings, which maintained itself on the throne until 1863, was chosen king by the people, who in this case used their ancient right of election to the throne. Christian II (1513–23) was such a tyrant that he lost his throne and his freedom; the Danes chose his uncle, Frederick I, to be their king, while Sweden was forever separated from Denmark. Under Christian IV, an able ruler handicapped by the opposition of the nobles, the Danish possessions still held in Sweden were lost, and with them the undivided control of the Sound. By the 18th century the peasants had become free from serfdom and the laws were better carried out. Copenhagen was bombarded in 1801 by the British under Nelson. A second British bombardment took place in 1807, when the Danish fleet was surrendered. From this time till 1813 Denmark was in the hands of Napoleon. Then she was forced to cede Norway to Sweden. In 1864 Prussia and Austria, as the heads of the German confederation, forced Denmark to give up Holstein and Schleswig. As a result of the World War the northern portion of Schleswig was restored. Extensively dismembered as she has been, Denmark has, however, prospered through the steady and combined industries of her thrifty people.

Christian IX, came to the throne in 1863, died Jan. 29, 1906, and was succeeded by his son Frederick VIII on whose death May 14, 1912 his son was crowned Christian X.

Dennison, William, war-governor of Ohio, was born at Cincinnati, O., Nov. 23, 1815; and died at Columbus, June 15, 1882. After graduating at Miami in 1835, he studied law, and in 1848 became a member of the state legislature of Ohio, and in 1860 was chosen governor. He was a stanch supporter of the Union, being an anti-slavery man, and incited the state to raise and equip troops for the prosecution of the war and to provide funds for their maintenance. Under Presidents Lincoln and Johnson he was postmaster-general. Governor Dennison was a philanthropic benefactor of Dennison University (formerly known as Granville College).

Den'sity is defined as the ratio of mass to volume. This term is so frequently misused by writers on scientific subjects, that it was considered worth while by the international congress of physicists, at Paris in 1900, to pass a resolution defining this quantity as stated above. Density and specific gravity are by no means the same, although one is proportional to the other. The specific gravity of any substance is defined as the ratio of its density to the density of water. The average density of a body is the ratio of the total mass of the body to the total volume of the body, while the density of a body at any one point is the limit which is approached by the ratio of a small mass about that point to the volume of this small mass.

Den'ver, the capital of Colorado, is situated north and east of the center of the state, 922 miles west of St. Louis. It is on a level plain, 5,196 feet above the sea, beyond which rise the snow-capped peaks and deep-blue shoulders of the Rocky Mountains. Denver was founded on a barren waste, dry and treeless, in 1858, and the close of the Civil War saw it a rising frontier-town. In 40 years the mining camp has been transformed into the Queen-City of the Plains, with stately buildings of brick and yellow stone and wide, shaded streets, provided with all the appointments of a modern American city; and it has become the meeting-point of a great network of railroad lines, with four direct lines to the east. The city now covers about 75 square miles on both sides of the South Platte River. It is the center of the great mining-interests of the state. It has a United States assaying mint, and three of the largest plants in the world for the smelting of ore are located here, giving employment to 2,000 persons and having an annual output in bullion of about $30,000,000. It also has a large trade in live stock, it being the central point between the breeders on the south and the breeders on the north. It has excellent public-schools, the value of its school-buildings alone being over $5,000,000; it has 209 churches and 230 miles of street railway. The main water-supply for the city is brought from the mountains; underneath the city, within a thousand feet, is abundant water for artesian wells. An uninterrupted area of 200 miles of a snow-capped mountain-range from north to south, a perfect climate and a beautiful city combine to make Denver one of the most attractive places of residence in the country, while the scenic attractions and climatic advantages of Colorado attract many tourists in search of health and pleasure. Population, 235,000.

De Pauw University is located at Greencastle, Ind. This institution was chartered

in 1837 as Indiana Asbury University. It was later enlarged and endowed through the liberality of Washington C. De Pauw, and in 1884 the name was changed to De Pauw University. It has a college of liberal arts and a school of music. The faculty numbers 51 and the student enrollment is 962.

De Quin'cey, Thomas, was born at Manchester, England, Aug. 15, 1785. His father, a linen-merchant, died when Thomas was seven years old, leaving his family well-provided for. His mother was of good family and wide culture. At school he was an apt scholar, and could talk readily in Greek at 15. When 17, his health failed, and, as his guardians refused to take him out of school, he ran away to wander and study in Wales. He soon made his way to London, where, after failing to raise money on his expectations, he was in serious want. He was finally sent to Oxford, but disliked his life there and left in 1807. It was in Oxford that De Quincey first used opium to allay pain; the use of the drug afterward became an overmastering and lifelong habit. He met Coleridge and visited Wordsworth and Southey at the English Lakes. In 1808 he went back to London, where he became an associate of Knight, Lamb, Hazlitt and other men of letters. In 1816 he married Margaret Simpson, "one of nature's gentlewomen." He edited a weekly paper and contributed to *Blackwood* and other magazines. In 1821 there appeared in the *London Magazine* his *Confessions of an English Opium-Eater*, which at once made him famous. Except a work on political economy and a novel, all his writings appeared in magazines. No magazinist of the first half of the 19th century holds a like high-place in English literature with De Quincey. His essays are on all manner of subjects, and are almost faultless in style. One of the best specimens of his impassioned prose, as it has been called, is his paper on *Joan of Arc*. He died at Edinburgh on Dec. 8, 1859.

Der'by, a manufacturing city of England, capital of Derbyshire lies on Derwent River, 129 miles northwest of London. A Roman station was on its site, and it was a royal borough in the time of Edward the Confessor. It has sent two members to Parliament since 1295. The Tower of All Saints, 175 feet high, is a fine piece of architecture. A very old chapel, that of St. Mary-on-the-Bridge, is still standing. Derby is the headquarters of the Midland Railroad, and is an important railroad-center. Its manufactures are silk, cotton, elastic web, lace, hosiery, iron, lead, shot, porcelain, marble, colors and chemicals. Silk was first manufactured here in 1719. Richardson and Herbert Spencer were natives of the town. Population, 123,433. Derbyshire is interesting for its fine churches, abbey ruins, feudal castles and manor-houses.

De Reszke, Jean, operatic singer and brother of Edouard de Reszke, was born at Warsaw, Poland, on Jan. 14, 1852. He studied under celebrated teachers in Italy and made his *début* in 1874, in Venice, as Alfonso in *La Favorita*. He has since appeared in the principal countries of the world in opera, as a tenor singer of great power and culture. He has also appeared in leading rôles in grand opera in the United States. His brother, Edouard, is possessed of a phenomenal bass voice, which he, however, uses artistically. His first appearance was at Covent Garden, London, in 1880.

Dermat'ogen (in plants). At the apex of a growing stem or root there is an embryonic region where the different parts of the plant-body are organized. That embryonic region at the apex which gives rise to the epidermis is called dermatogen, the name literally meaning the epidermis-producer.

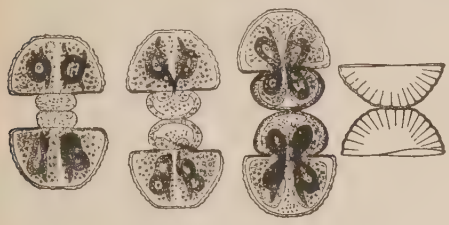
Descartes (*dā'kärt'*), **Rene** generally regarded as the father of modern philosophy, was born at La Haye, near Tours, France, on March 31, 1596. At school he was an apt scholar, but on leaving college he found it impossible to believe what had been taught him and was at the time held to be accurate knowledge. He threw away his books and strove to forget all he had learned, so as to leave his mind free to find out what was really true in all departments of thought and study. He enlisted as a soldier, afterward traveled, and then settled down in Holland for 20 years of study and writing. Here appeared his *Discourse on Method* and other works on philosophy. Descartes also wrote on physics and mathematics; and it was in mathematics that he made his greatest and most lasting discoveries, especially in algebra; while analytical geometry was founded by him. He died at Stockholm on Feb. 11, 1650.

Deschanel (*dā'shä'nĕl'*), **Emile A.,** a French educator, writer and member of the French senate, was born at Paris on Nov. 14, 1819. His writings embrace *Aristophanes; Benjamin Franklin; The Theatre of Voltaire* and *The Romanticism of the Classics*. He died in 1903.

Deschanel (*dā'shä'nĕl'*), **Paul Eugene Louis,** son of the above, statesman and president of France (1920–) is not a native of France, having been born in Brussels during his father's exile under Napoleon III. He entered the French Chamber of Deputies in 1885, became vice-president of that body in 1896 and its president from 1898 to 1902 and 1912 to 1916. Besides his numerous works on public questions his writings include *Figures de femmes; Figures literaires; Madame de Sevigne* and *Lamartine*. In 1899 he was made a member of the French Academy.

Des'mids, a group of plants belonging to the green algæ, but very different from

the ordinary forms. The plant-body consists of a single cell which is always composed of two similar halves, usually separated from one another by a deep constriction. The desmids occur in a great variety



DESMIDS

of forms, and their walls are often ornamented by delicate markings. The markings and patterns of these peculiar bright green cells make them favorite objects under the microscope.

Des Moines (*dă-mŏin'*), the capital and largest city of Iowa, is on the site of Fort Des Moines, which was a United States garrison in 1832 and at that time the farthest west of the northwest forts. At present this fort has new and modern equipment, making it one of the finest posts in the United States. It is situated in a lovely valley of the corn and blue-grass belt, surrounded by sloping hills, and is rich in coal-mines and deposits of clay and shale. Among its products are wire-fencing, carriages, pork and cotton and woolen goods, brick, sewer-pipe, etc. The output of 25 or more brick and clay-product factories exceeds 1,500 carloads annually. It is one of the leading railroad-centers of the country, having nine trunk-lines, which operate 19 distinct roads in and out of the city, besides electric-car service. Des Moines is the home of 44 insurance companies, has 94 churches, several colleges and technical schools, 47 public-school buildings, 19 banks, 4 daily papers, etc., and has a large jobbing trade. Population, 86,368

De Soto (*dā sō'tō*), **Fernando,** was born at Estremadura, Spain, about 1498, of a good but poor family. He proceeded under other captains on a voyage to Darien in 1519 and on an expedition to Nicaragua in 1527. He helped Pizarro to conquer Peru, and returned to Spain with a fortune. Charles V now gave him permission to conquer Florida at his own expense, and made him governor of Cuba. In 1538 he sailed with 600 men, 20 officers and 24 priests. The little fleet anchored in the bay of Espiritu Santo (now Tampa Bay), on the 25th of May, 1539. The ships were sent back to Cuba, and the long search for gold was begun. For three years, harassed by Indians, lured onward by reports of wealth that lay beyond, the ever-lessening company kept up their wearisome march over a route that cannot now be clearly traced. In 1541 the Mississippi was reached and crossed, and the third winter was spent on Washita River. Returning to the Mississippi in the spring, De Soto, worn out by disappointments, died of a fever on its banks in June, 1542. In order that his death might be hidden from the Indians his body, wrapped in a cloak, was lowered at midnight into the waters of the great stream he had discovered. In the following year about half the number of the companions with whom he had set out sailed down the river in seven frail boats, and at last reached Panuco in Mexico.

Detaille, Jean Baptiste Edouard (*zhŏn băp-tēst ĕd-oo-ärd, dē-tä'y'*), a French painter, was born in 1848, and is distinguished for his treatment of military subjects. *The Passing Regiment* is one of his best pictures. It is in Corcoran Gallery, Washington, D. C.

Detroit, the largest city and metropolis of Michigan, is situated on the Detroit River, which connects Lakes Erie and St. Clair, and is the outlet of the upper Great Lakes. The city is 18 miles from Lake Erie, 7 miles from Lake St. Clair and 284 miles from Chicago. The river at this point runs nearly east and west, so that Detroit lies on the north side of the river, facing the Canadian village of Windsor. It has an area of 35 square miles. From the public square known as Campus Martius the main avenues of the city radiate. Here is the center of the business-district, solidly built, with wide, clean streets and many tall, imposing buildings. Woodward Avenue, the main artery of the city, runs north from the river, extending into the country and dividing the city into two nearly equal parts. On the lower end of this avenue and on adjoining streets is the shopping-district, while farther out, this and adjoining avenues are marked by magnificent churches and the fine residential district. Among the notable structures are the Soldiers' Monument, the County Building, which cost some two million dollars, City Hall, the Elks Temple and the Detroit Opera House. Grand Boulevard a macadamized thoroughfare 150 feet wide and 11 miles long, encircles the business portion of the city. Belle Isle, a beautiful island of about 700 acres, is connected with the mainland by a magnificent bridge and constitutes the main park of the city. It is an island of great natural beauty and has been improved at a cost of over two million dollars. This magnificent park, so beautifully situated and improved, together with the smaller parks which dot the city, and its broad avenues lined with trees combine to make the City of the Straits one of the handsomest cities in the country.

The growth of Detroit has been steady and substantial, resting upon the increased

volume of her manufacturing and commercial interests. Its manufactories include foundries, blast-furnaces, copper-smelting works, locomotive and car-works, shipyards, iron-bridge works, safe, furniture, automobile and stove-factories and some of the largest tobacco and cigar-factories in the United States.

The city is the seat of the United States district and circuit courts of eastern Michigan. It has many hospitals and philanthropic institutions, and is noted for the large number of fine churches and its well-equipped public-schools. There are more than 70 school-buildings, besides three high-schools. Here also are the Detroit (R. C.) College, medical schools, law-schools, etc. Detroit is an important railroad-center and is one of the five chief lake-ports.

Detroit is one of the oldest American cities. It came into the possession of the French in 1610, who built a fort here in 1701, called Pontchartrain. The British held it from 1763 till 1796, when it passed to the United States. In the War of 1812, Detroit was captured by Sir Isaac Brock and held by the British for about a year. In 1824 the city was incorporated; from 1805 to 1837 it was the capital of Michigan Territory, and for the following ten years the capital of the state.

Adjacent to the city and commanding it and the approaches to the river is Fort Wayne. Population, about 1,000,000.

Deucalion (*du-kā'li-on*), the hero of the Greek story of the flood. He was the son of Prometheus and the husband of Pyrrha. When Zeus had decided to destroy the race of men by a flood, Deucalion built an ark or ship, in which he and his wife floated during the nine days' flood which drowned all the other people of Greece. On the going down of the waters, the ark rested on Mount Parnassus. To repeople the world, Deucalion and Pyrrha were told by the goddess Themis to throw behind them the bones of their mother. This they did with the stones of mother-earth, and from those thrown by Decaulion, so the story goes, sprang up men, and from those thrown by Pyrrha sprang up women.

De Valera, Eamonn (Edward), Irish popular leader, born near Cork, Oct. 14, 1882. He received a good education and for about ten years devoted himself to teaching. He joined Sinn Fein, but was not active until 1913, when he also joined the Irish Volunteers. He was one of the leaders of the Easter Rebellion of 1916, and in the next year was elected by the Sinn Fein convention "President of the Irish Republic". Though he took part in the early negotiations, he opposed the treaty creating the Irish Free State, and resigned the presidency in 1922.

Development of Animal Life. The building of an animal's body is the most wonderful thing in all nature. An insect, a fish or a bird begins its development as an egg, and, as the construction of the body goes on, each tissue and each organ are formed anew out of the material contained within the egg. After three weeks' incubation of the hen's egg, for example, the young chick steps into the world with heart, brain, eyes and other organs all formed—a remarkable transformation. Frogs' eggs, laid in the water, undergo similar changes without any care from the parent; tadpoles hatch from them, and in due course of time these tadpoles grow into frogs, with a different kind of body. The hen's egg is large, because there is a large quantity of food-yolk stored up for the use of the growing chick; the frog's egg is smaller, because it contains less yolk; and some eggs —for example, those of starfishes—are smaller than pin-heads. The true starting-point of the chick is a microscopic cell within the egg; and, when we look to other animals, we find that all of them, no matter how complex, start in the condition of a single microscopic cell and that, between that simple state and the fully formed animal, which is complex, there are many steps. Therefore, the adult stage of any animal represents the last step in a long series of modifications. If we could only follow the changes, step by step, we should have a means of understanding all about the construction of animals and their past history. Tracing the stages by which cells emerge into tissues, tissues into organs and how the organs by combination build the body is called embryology or development. It is an important fact to keep before us that the rudiment of all life is a cell. (See CELL-DOCTRINE.) If we look upon cells as the bricks of organic architecture, the starting-point of a many-celled animal is a single brick; but, inasmuch as each egg needs to be fertilized before developing—just as a plant-ovule must be fertilized by pollen before it becomes a seed—the single brick is a compound one, made of material derived from each parent. The development of all animals is remarkably alike; from the single cell there come, by division, many cells; these continue to feed on the yolk, to grow and divide; and thereby a large number of cells arises. These cells arrange themselves into definite layers, from which all parts of the body are formed.

The earlier view of development was that the animal existed already formed within the egg, but was exceedingly minute, and that development consisted in the expansion or growth of this animal in miniature. But William Harvey (1598-1657) and Caspar F. Wolff (1733-94) showed the falsity of this view. The latter especially in 1759 showed (in *Theoria Generationis*) the true nature of development to consist in a real becoming or gradual formation, step by step, of the organs and the animal's

body. This, of course, was opposed to the view that the embryo was preformed. The acceptance of his work was long delayed on account of the opposition of Haller the great physiologist and of others, but in 1812 it began to receive notice after the long period of neglect, and in the course of a few years the truth that Wolff contended for was triumphantly established. This was the first epoch in modern embryology.

The second epoch was created by K. E. von Baer in showing that all the tissues and organs come from cell-layers or germ-layers. Baer (1792-1876) is regarded as the father of modern embryology. In 1828 he published his great work on the development of animals, in which he showed that the numerous cells, produced by division of the orginal cell, become arranged into three layers—an outer, a middle and an inner layer—and that this is true for all animals above the very lowest. These layers are called the germ-layers, and each one gives rise to a particular set of tissues and organs. For example, from the outer germ-layer there comes, in all animals, the nervous system, including the brain, spinal cord, nerves and sense-organs; the outer covering of the body with parts like scales, feathers, hair. The middle layer splits into two sheets and is very complex. It gives rise, in all animals, to muscles, heart, blood-system, connective tissue, including cartilage and bone, etc. The inner layer forms the lining of the alimentary tube, etc. It is a remarkable fact that the organs of the many different kinds of animals are essentially alike in origin. This fact unites them all on a broad plane and is of great meaning in understanding their history. It is called the germ-layer theory. Modern embryology has largely become a study of the origin and history of the germ-layers.

Another epoch of advance is marked by the work of Kowalevsky, who in 1866 broke down by embryological study the rigid line that was supposed to separate invertebrated and vertebrated animals, and thereby brought them closer together. In 1881 Balfour, one of the greatest of modern embryologists, brought together all that was known about the development of animal life, from sponges to the highest animals, and published it in his *Comparative Embryology*. From that time the advance of knowledge about this subject has been very great, and embryology is looked upon as one of the most important of the biological sciences. It enables us to get at the past history of animals, and throws much light upon their relationships one with another. All animals have had a history. Development shows what that history has been. There is good reason to believe that the higher animals have been derived gradually from the simpler ones. It follows that the higher ones had simpler ancestors, who might have lived very far in the past. In the course of their development animals repeat to a certain extent the story of their past, and, therefore, certain traces of ancestral organs make their appearance. Let us take, for example, the chick developing in the hen's egg. This is a bird; nevertheless, gill-clefts that belong to fishes and smack of a water-life, make their appearance in the developing bird and then fade away. The heart is also, at the same time, two-chambered as in the fish, and the blood vessels are arranged in the gill-arches as in the fish. These rudimentary organs are not of use to the young bird for breathing, but their presence means something; they are not there by chance. The best explanation seems to be that they are inherited from the remote ancestors of the birds, which were water-breathers. Many other rudimentary organs arise and disappear, and are explained in a similar manner. It is an astounding fact that the gill-clefts arise in all of the highest animals, without exception, and their presence is taken to indicate that the remote ancestors of all were water-breathers and had use for gills. The rudimentary organs referred to of course disappear long before the animal is hatched or born into the world. These structures give clues to former conditions, and the traces we find are like records left by the hand of time upon the embryo. The reading of this embryological record is like reading the hieroglyphics and inscriptions made by ancient people upon monuments, temples and columns, but the inscriptions on the embryo go farther back into the past. In like manner, the stages of the frog show its history. The tadpole is at the level of a fish, but it undergoes further changes and transforms into an air-breathing animal. Now, since the most complex organs of animals start in a state of simplicity, it follows that, if we take them in their simplest stages and see all the modifications as they are added, we shall be better able to understand them. This is of wide application, and shows why embryology is so important in zoology and also in botany. Observations on development throw more light on animal-life than comes from any other single source.

WM. A. LOCY.

Devonshire, Spencer Compton Cavendish, eighth Duke of (long known in English politics as Marquis of Hartington), was born July 23, 1833, and educated at Trinity College, Cambridge. He entered Parliament in 1857 as member for North Lancashire, in the Liberal interest, and in April, 1863, was made under-secretary of state for war in Lord Russell's administration. In 1866 he became secretary of war,

and later was postmaster-general in Gladstone's first government. In 1874 he was chosen leader of the Liberals in the Commons, and in 1880 was offered the premiership, but declined. In Gladstone's second administration he was secretary for India; and, when his chief formulated his home-rule policy, became recognized leader of the Liberal Unionist party. In 1895 he was made lord-president of the council in Salisbury's cabinet. In 1900 he became president of the Board of Education, but three years later resigned on the question of tariff-reform. He was chairman of the Unionists' Free-Trade Club. He died March 2, 1908.

Victor Christian William Cavendish, ninth Duke of Devonshire, born May 31, 1868, was educated at Eton and Cambridge. He was governor general of Canada 1916-21.

Dew. Everyone knows that a glass of cold water when brought into a warm room, soon becomes covered with moisture. Careful observation shows that this moisture comes from the air immediately round about the cold object. In the same way, on a clear and reasonably still night, bodies which radiate heat will become cooler than the surrounding atmosphere and will, therefore, condense upon their surfaces some moisture from the surrounding atmosphere. The minute globules of water thus formed are called dew. The only difference between the formation of dew and the deposit of water upon a tumbler is that in the former case it is those bodies which *radiate* heat rapidly that collect the dew most easily, while in the latter case, it is those bodies which *conduct* heat most readily that collect the moisture of the air most rapidly. Two very important facts in connection with the deposit of dew remain to be explained. The first is that dew does not form on cloudy nights; the second is that dew does not form during a windy night. The explanation is as follows: The clouds act as a warm blanket between the radiating body and free space. Compared with the temperature of free space, clouds are very warm, and radiate much heat back to the earth. In the case of winds, if they are at all strong, they will, in passing over any body, communicate so much heat to it that the temperature of the body cannot fall as far as the dew-point, *i. e.*, the temperature at which condensation begins.

De Wet, Christian, a burgher-general in the Boer War of 1899-1902, noted for his great alertness and ability in conducting a guerrilla-warfare, was born in the Orange Free State about the year 1855. Though long a simple farmer and member of the *volksraad*, he took part in the burghers' war against the Basutos and fought against the British at Majuba Hill. In the Boer war he showed himself a skillful strategist, though unfeeling and even brutal as a commander. In 1902 he made his peace with Britain, and in that year he paid a visit with General Prother to England and the United States. He died 1922.

Dew'ey, George, American admiral, was born at Montpelier, Vt., Dec. 26, 1837, and graduated from the United States Naval Academy in 1858. He served with distinction in the Civil War, both in the western Gulf-squadron and in the North Atlantic blockading-fleet, taking part in the battle of New Orleans and in two attacks on Fort Fisher. He was made lieutenant-commander in 1865, commander in 1873 and captain in 1884. In 1897 he was placed in command of the Asiatic squadron as commodore. He became famous by his great naval victory in Manila Bay, May 1, 1898, when he destroyed the entire Spanish fleet without the loss of a ship or a man. He was soon promoted to the rank of rear-admiral, and on March 4, 1899, was made admiral, being the third to hold this highest office in the American navy. In September, 1899, on his return from the Philippines, Admiral Dewey was accorded a great reception by the city of New York and given, with a loving-cup, the freedom of the city. He died in 1917.

De Witt, Jan, a celebrated statesman of Holland, was born at Dort in 1625. He inherited from his father a hatred of the family of William, Prince of Orange, afterward William III of England. De Witt's influence was lost when Louis XIV of France attacked the Netherlands, as it was known that he had favored the French. William of Orange was made stadtholder or chief-magistrate of the state and appointed commander of the Dutch forces. De Witt went to visit his brother Cornelius, who had been imprisoned for conspiracy against the life of the stadtholder, when they were attacked by a mob and both were murdered at The Hague on Aug. 20, 1672.

Dextrin. See STARCH.

Dhawalaghiri (*dä-wol'a-ger'ē*), once supposed to be the highest peak of the Himalayas, but now known to be at most only the third in height. It is in Nepal, and is 26,826 feet above the sea.

Di'al. A sundial is an instrument for measuring time by means of the motion of the sun's shadow cast by a stile or pin set upon its surface. It is an instrument of great antiquity, and before clocks and watches became common it was in general use as a time-keeper. A dial consists of two parts: the stile, usually the edge of a plate of metal, so adjusted that this edge will be parallel to the earth's axis and point toward the north pole; and the dial-plane or plate, made of any hard substance, on which are marked the directions of the shadow for the several hours of the day. A night-dial is an instrument for showing the hours of the night by the

shadow of the moon or stars. It is to be remembered that the time indicated on the dial is apparent time and not mean solar time as given by our clocks and watches.

Diamond, one of the most valuable of the precious stones, is a natural form of carbon. In its natural state it often is of a dull-lead color, but when carefully cut has a brilliancy unequaled by any other stone. It is the hardest of all the minerals, and can be distinguished from other gems by this quality. A stone that will scratch a ruby or a sapphire must be a diamond. Diamonds are usually found in the sand and gravel of river-beds. India was for a long time the only country where diamonds were found, and all the great historical stones of the ancients came from that region. In 1727 diamonds were first found in Brazil. A large diamond weighing 254½ carats when found and 125 carats after cutting was picked up by a negress in 1853 in the river Bogagem. It is known as the Star of the South, and was sold to the Gaikwar of Baroda for $400,000. In 1867 diamonds were found in South Africa, not only in the river gravels but in the rocks. The principal South African diamond-mine is at Kimberley, which produced in 1905 diamonds valued at £6,758,673 (over $33,000,000). There are more large stones found in the mines of South Africa than in India or Brazil. In 1897 the Jubilee diamond of 972 carats uncut was found at Kimberley. In 1905 the Cullinan diamond, an uncut stone of 3,024¾ carats, or 1.37 pounds was found in Transvaal. It is larger than a man's fist, is part of a stone estimated to have weighed nearly 6,000 carats and is approximately valued at $2,500,000. The Transvaal purchased it and gave it to King Edward VII. Diamonds are also found in Australia, in the Ural Mountains, and in several of the United States. In 1906 a diamond-field was discovered in Arkansas. The largest diamond ever found in North America came from Manchester, Va. Artificial diamonds have been made but cost many times more than the natural diamond. Among historical diamonds are the Koh-i-nur, the Great Mogul, the Orloff, the Regent and the Hope diamond. The Koh-i-nur, meaning mountain of light, dates back to 1304. When it belonged to Aurungzebe, it was used as one of the eyes of the peacock which adorned his famous peacock-throne. When the British obtained possession of Lahore, the diamond was presented to the queen of England. The Orloff weighs 193 carats, and is mounted in the scepter of the czar of Russia. The Regent is preserved among the national jewels of France. The Hope, a sapphire-blue brilliant, is one of the most finely colored diamonds known, and is worth $150,000. See Streeter's *Great Diamonds of the World and Precious Stones and Gems.*

Diana (*dī-an'ā*), a Roman goddess, known as Artemis among the Greeks. She was the

DIANA

twin-sister of Apollo, and was goddess of the moon, the flocks and the chase. She is represented as a young and handsome hunter, carrying a bow and a quiver of arrows and followed by dogs or stags. As goddess of the moon she is clothed in a long robe, her head covered by a veil and a crescent moon above her brow. The most famous statue of her is the *Diana of Versailles*, found in Hadrian's villa near Tivoli, now preserved in the Louvre. Diana of the Ephesians, mentioned in the New Testament, was an Asiatic goddess entirely distinct from the Roman Diana.

Diana, Temple of. See EPHESUS.

Di'atoms. A group of peculiar plants which are sometimes included among the algæ, and sometimes regarded as a group of thallophytes distinct both from algæ and fungi. They are one-celled, and occur in great abundance in both fresh and salt waters. They are free-swimming or attached by stalks; solitary or in chains. In form they are straight or curved, shaped like rods, boats or wedges. Their chief peculiarity is that the wall is in two halves which fit into one another like the two parts of a pill-box. The wall also is full of silica, and is practically indestructible. Diatoms occur in such vast numbers

A DIATOM FROM TWO POINTS OF VIEW

in the ocean that they form a large part of the free swimming organisms on the surface, and doubtless their siliceous skeletons are constantly falling on the sea-bottom. There are rock-deposits known as rottenearth, often used in polishing, that are absolutely made up of the skeletons ofdiatoms. On account of the fine lines which occur upon the siliceous walls, various diatoms have long been used as tests for microscopes, and the group is a favorite one with microscopists.

Diaz, General Armando, who, as commander-in-chief of the Italian forces in the European War (*q. v.*), won the first great victory of the campaign of 1918, hurling the broken and demoralized Austrian army back across the Piave, was born in Naples, Oct. 5, 1861, of an old Spanish family that went to Italy with Charles III of Bourbon in the 18th century. The defeat of the Austrians was, in military importance, one of the great events of the war. For Italy it had a value similar to that of the Marne for France. The brilliancy of the achievement of Diaz and the heroic and resourceful soldiers under his command can be measured by the fact that while the Austrians struck with a million men after six months' preparation, they were not only defeated, but routed by Diaz with the use of only a small part of his available reserves. It is interesting to note this is an instance in which history did not repeat, but reversed itself; for it was fifteen centuries before that Atilla and his Huns drove the ancestors of the Venetians fron the Italian mainland into the marshes and lagoons between the Piave and Sile rivers where they founded the colonies which later became Venice (*q. v.*).

Diaz, Porfirio. In 1877 it would have been unsafe for a well-dressed man to go about Mexico City unattended, while bandits infested the country-roads and robbed the mail-coaches. Thirty years later there were 20,000 miles of railway, 40,000 miles of telegraph and 22,000 post-offices; the capital is lighted by electricity and noisy with steam-locomotives and trolley-cars; and Porfirio Diaz, "perpetual president" of the republic went about afoot or in his carriage.

PORFIRIO DIAZ

To the life of this extraordinary man history offers no parallel. His career, his achievements and his position are unique. Alone and unaided, with ability matched only by incorruptible patriotism, Porfirio Diaz transformed Mexico, lifted it from oblivion, rescued it from bankruptcy, brought order out of three centuries of chaos; won self-respect and the respect of the world for the people of Mexico from 300 years of degradation under Spanish rule.

In 1821 Mexico threw off the yoke of Spain and began its long struggle upward from poverty, ignorance and disorder. In the midst of the turmoil Porfirio Diaz was born on September 15, 1830, in the tropical state of Oaxaca. A typical Mexican of the poor class he was, and of mixed Spanish and native blood, for his grandmother was a Mixteco Indian. His father dying when he was three years of age, the boy roamed the cactus-and-aloe-strewn desert, and often sat at camp-fires with soldiers—government troops or rebels as it happened. At 17 he walked 250 miles to enlist in defense of his country in the Mexican War (1848), and saw half of Mexico's territory signed away to the United States in the year (1849) that gold was discovered in California.

That war over, Diaz became a rebel against Santa Anna's corrupt and oppressive rule. For the next 25 years, in fact, a Mexican patriot had no choice but to be a rebel and outlaw, for the country was ruled successively by dictators, despoilers and invaders. In 1862 President Juarez, thinking to relieve the impoverished land, suspended payment of the national debt to Great Britain, France and Spain. The United States, then in the second year of the Civil War, was unable to resist the invasion of Mexico by 40,000 French troops and the establishment of the Austrian archduke Maximilian as emperor in Mexico City. At the head of a patriot-army Diaz resisted French occupation. He was wounded, imprisoned, was a fugitive and an exile, had his army scattered, was offered bribes to desert his cause; but he helped bring about the downfall of the alien empire. The election of Juarez as president (1871) was the signal for a new revolution led by Diaz. The year 1877 saw the hero of 50 battles installed president in Mexico City by a victorious army.

The fighting stopped immediately, for the first time in 60 years. Mexico was told to go to work, live peacably and pay her debts. In theory the democratic form of government was preserved, but in practice the patriarchal was adopted. Diaz became the fatherly ruler, guiding and restraining. The people were poor and ignorant, the land devastated, perishing. After two generations of treachery, self-seeking and strife, education, industry, civic honesty and peace must slowly build up the land and people. Diaz stamped out rebellion relentlessly. It was years before the world understood his lofty patriotism. It was expected that he would declare himself dictator and then emperor. Rooted deep in the affections of the people, he could have

worn a crown. Instead, he cut his official salary to $15,000 a year, and shamed wealthy officials from accepting any salary at all.

When Diaz became president in 1877, Mexico had about 9,000,000 people, of whom 8,000,000 or more were ignorant poverty-stricken peons. When he finally resigned office there were 15,000,000 people with a large middle class of public-spirited citizens. Of railroads it had 500 miles, which grew to 19,000, of which 10,000 were partially government owned. The state revenues of $15,000,000 had been increased to $120,000,000 with a constant decrease in taxes. Thirty years before Mexico had no credit. Under Diaz it had a bonded debt of $200,000,000 and a surplus of $78,000,000. Its debt doubled by depreciation of silver, it adopted the gold standard and met its obligations. The sum of $12,500,000 was expended on Vera Cruz harbor and $30,000,000 on the National Railway and on two harbors on the Isthmus of Tehuantepec. Imports and exports developed from $18,000,000 to $248,000,000. Foreign capital to the extent of $1,200,000,000 was freely invested in Mexican mines, railways, factories and plantations, and $200,000,000 of new money was pouring in every year. Public education had been established, manufacturing and trade were on the increase. The revenues were honestly collected and expended. There were then no public scandals. The uncrowned king of this republic had no private fortune. He lived on his salary of $25,000 a year, in a modest house in the city or in Chapultepec Castle, in simpler style than did many citizens. Once, when Diaz was reported to be seriously sick, Mexican bonds fell several points. Not long after the inauguration of Diaz in December, 1910, there appeared evidences of popular unrest, and early in 1911 there came open revolt under the leadership of Francisco I. Madero. Demands for reforms and broader exercise of popular rights were met by sweeping concessions from Diaz and his cabinet, but still the revolt grew. There was fighting at different points in the Republic, chiefly in the north. At length, rather than see his country deluged in war, Diaz resigned his office as president, and on May 31 he sailed from Vera Cruz for Europe, an exile from the land he had so greatly developed and enriched (See MEXICO.) He died July 2, 1915.

Dichogamy (*dĭ-kŏg' ă-my*) (in plants). The condition in flowers in which the stamens and pistils do not mature at the same time. For example, the stamens may be ready to shed pollen when the stigma is not yet ready to receive it, or the stigma may be ready to receive pollen before the stamens are ready to shed it. There are thus two forms of dichogamy, one in which the stamens mature first (protandry), the other in which the stigma is ready first (protogyny). See POLLINATION.

Dichotomy (in plants). The method of branching in which the tip of the axis divides. The contrasting method is monopodial branching. See BRANCHING.

Dick'ens, Charles, a great English novelist, was born at Landport, near Portsmouth, Feb. 7, 1812; and died at Gadshill, near Rochester, England, June 9, 1870. When he was nine years old, the family fell into poor circumstances and moved to one of the poorer quarters of London, where the father was soon after arrested for debt, and Charles was placed in a blacking-factory. Not long after, his father was released and Charles was sent to school once more, where he stayed for three or four years. He then prepared himself to be a journalist, and became reporter on a London paper when he was 22. He then began writing for magazines and journals, and in 1836 his success was assured by the appearance of *Pickwick Papers*. Others of his works soon followed, and the remainder of his life was a record of one literary success after another. In 1842 Dickens visited America. His *American Notes* and *Martin Chuzzlewit* are satirical accounts of American manners and life. In 1850 he founded *Household Words*, a weekly periodical, in which several of his works appeared as serials. In 1859 this periodical ceased to be published, but Dickens issued another, called *All the Year Round*, for which were written several other of his novels. Dickens always had a strong liking for the drama, and often acted in private theatricals. His real ability as an actor was shown in his public readings of selections from his works. He gave many of these readings both in England and America, and it is said that his receipts in money from them were more than from all his novels. Perhaps more than any other English writer, Dickens put his own boyhood into his novels. Mr. and Mrs. Micawber are drawn from his own father and mother. *David Copperfield*, probably his greatest work, is said to be largely a story of his own life; while many others of his characters he had met when a boy, in his work at the blacking-factory, when visiting his father at the debtor's prison, at the Portsmouth dock where his father was a navy-clerk, or while he was at school. Few novelists are so universally read; prob-

CHARLES DICKENS

ably no one is so universally liked. His characters are taken from actual life, and call out the best sympathies of the reader. Among his works, besides those already noticed, may be mentioned *Old Curiosity Shop*, *Dombey and Son*, *Little Dorrit*, *Tale of Two Cities*, *Our Mutual Friend*, *A Christmas Carol* and *The Mystery of Edwin Drood* (unfinished). See his *Letters* and the *Life* by Forster.

Dick'inson, Anna Elizabeth, an American lecturer and author, was born at Philadelphia, Oct. 28, 1842. She early began to lecture on temperance and against slavery, and meantime was employed at the United States mint at Philadelphia, but afterward lost her position and then made lecturing her profession. She spoke in the political campaigns of several states in 1863. She was opposed to the election of Lincoln in 1864, and favored that of Greeley in 1872. During the war she delivered many patriotic addresses, and since then has spoken often on woman's suffrage and other questions. In 1875 she went on the stage, writing two plays, in both of which she acted the principal part.

Dickinson, Emily, an American poet, was born at Amherst, Mass., Dec. 10, 1830, and died there, May 15, 1886. A recluse all her life, she wrote much but published little. In 1890, however, a collection of her verse appeared that severe critics recognized as revealing a rare genius and as enriching American literature with minor lyrics of unique form. Another collection was published in 1892, and her letters in 1894.

Diclinous (*dĭk'lĭ-nŭs*) **Flowers.** Those which contain either stamens or pistils, but not both. Staminate and pistillate flowers, therefore, are diclinous. This diclinism may involve not merely the flowers but the plants which bear them. For example, staminate and pistillate flowers may occur on the same plant, in which case it is said to be monœcious. In other cases the staminate and pistillate flowers may be upon different plants, in which case the plants are said to be diœcious.

Dicotyledons (*dī-kŏt'ĭ-lē'dŭns*). One of the two subdivisions of the great plant group *Angiosperms*. Dicotyledons are the highest group of plants in rank, and they also contain more species than any other group, nearly 100,000 having been described. They are herbs, shrubs and trees of every variety of size and habit. The name comes from the fact that the embryo develops two cotyledons. The other features which distinguish the group in general are the structure of the stem, in which the woody bundles form a hollow cylinder; the net-veined leaves; and the parts of the flowers in fives or fours. There are two great series of dicotyledons which are distinguished from one another by their petals. In the first series either there are no petals at all, or they are separate from one another. To this series belong the common forest-trees (as oak, hickory, walnut, beech, elm, poplar), buttercups, water-lilies, mustards, roses, legumes and umbellifers. In the second series the petals are united to form urns, tubes, funnels and like forms. To this series belong the heaths, morning-glories, phloxes, gentians, mints, verbenas and composites.

Diderot (*dē'd'-rō'*), **Denis,** was born at Langres, in Champagne, France, on Oct. 5, 1713, of cutlery-manufacturing family. Refusing to become either a lawyer or a physician, his father cut off his allowance, and for ten years he led a haphazard life in Paris as tutor and hackwriter for booksellers. The first book he wrote got him into hot water, as it was ordered to be burned by the government. For writing another he was imprisoned. His commanding position in the world of letters came with his appointment as editor of a new encyclopædia. The various volumes appeared between 1751 and 1765. What the publishers had intended to be an encyclopædia became, in Diderot's hands, an engine of war on what was known as the philosophical party in France. The beliefs and ideas of this party here found expression, and the leaders of the party came to be known as the encyclopædists. When it is called to mind that these ideas were the first entering of the wedge that later upset France in the Revolution of 1789, it will be understood how bitter the government was against these philosophers. Diderot enlisted nearly all the important French writers of the time as contributors. For some twenty years he stood at his post in spite of dangers and drawbacks. The book was again and again threatened with persecution, and Diderot was all the time in danger of imprisonment or exile. Diderot was a very ready writer, and wrote a great deal. He wrote novels, plays, satires, philosophical essays and criticisms of pictures and books. In his later years the author fell into money-troubles, from which he was rescued by Catharine II of Russia, who bought his library and allowed him to keep it in Paris, paying him for taking care of it. Diderot died at Paris on the 30th of July, 1784. See *Diderot and the Encyclopædists*, by John Morley.

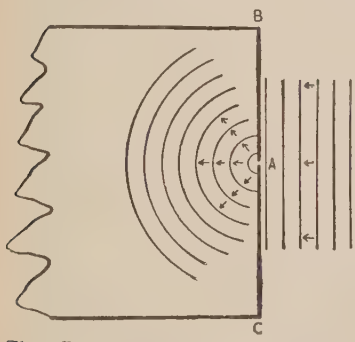
Dido (*dī'dō*), according to the old stories the founder of Carthage, was the daughter of the king of Tyre and the sister of Pygmalion. Pygmalion succeeded to the throne, and murdered Dido's husband and her uncle, Sichæus, who was a priest of Hercules, but searched in vain for the treasure that Sichæus was known to have. With this treasure and many Tyrians Dido escaped to sea. She landed in Africa near Utica, and built a city called Byrsa, meaning the hide of a bull, on a piece of land which she bought. It is said she bargained for as much land as could be covered by a bull's hide. Once the agreement

was made, she cut the hide into small thongs and so surrounded a large piece of ground, on which rose the city of Carthage. Vergil represents Dido's death to have been caused by the desertion of Æneas, who left her and sailed to Italy.

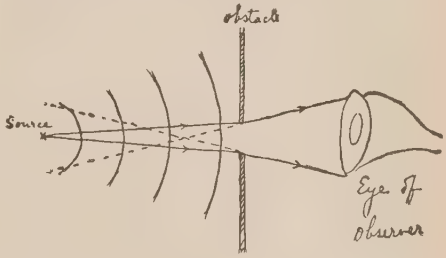
Dies Iræ (*dī'ēz ī'rē*), the name of a celebrated Latin hymn, the title coming from the first line, *Dies iræ, dies illa.* Its subject is the Last Judgment. It first appeared at Venice in 1250. No religious poem has been oftener translated; but no one of the hundred or more versions which have been made is equal to the original in poetic fire and religious fervor. This is Scott's rendering of the first stanza:

> The day of wrath! that dreadful day.
> When heaven and earth shall pass away!
> What power shall be the sinner's stay?
> How shall he meet that dreadful day?

Diffrac'tion, a phenomenon which occurs when waves of any kind pass the edge of an obstacle. The simplest illustration of the phenomenon is perhaps the case of waves washing up against a breakwater with an opening in it. As shown in the accompanying figure, the wave does not pass through the small opening A undisturbed, but spreads out in all directions, giving rise to a series of more or less spherical waves. This spreading out is called diffraction, which is merely the Latin word for bending apart. The easiest waves with which to observe diffraction are light-waves. For this purpose it is only necessary to take a sewing-needle and prick a very small hole in a visiting card. Now hold this hole immediately in front of the eye and look through it at some small or narrow source of light, say the filament of an incandescent lamp. The filament will not appear so bright as without the card, but it will appear much wider, showing that the light-waves from any one point on the filament, in passing through the small hole (that is, in passing the edge of the obstacle) are spread out into a cone, as indicated in the accompanying figure, so that the source of light appears to subtend the angle included between the dotted lines. This phenomenon is known as the diffraction of light. Sound-waves behave in the same way. A beautiful case of diffraction, which may be observed almost any evening on a street illuminated by arc-lights, is the following: a twig of a tree, a lead-pencil or any opaque



The effect produced upon waves by a small opening in a breakwater



object will give a shadow on a white card which you may hold in your hand. This shadow will be bordered by two or three lines alternately bright and dark. These bands are due to diffraction past the edge of the opaque obstacle. They were discovered more than 200 years ago by an Italian, and are called, after him, Grimaldi's fringes. The explanation of them, which is too long for this brief sketch, was first given by Fresnel in the early part of the 19th century. See Preston's *Theory of Light.*

Diffrac'tion-Grating, an instrument for separating from one another light-waves of different lengths. A diffraction-grating is simply an instrument which, when placed in the path of a pencil of light, will impress a different direction upon each different color which is present in the pencil of light. A grating consists of a large series of very narrow, parallel apertures equidistant one from another. The light-waves, in passing through these apertures, are diffracted, and each wave-length is sent off in a different direction from every other wave-length. Just how this happens is too complicated for explanation in this brief sketch. Diffraction-gratings were devised by the distinguished German optician, Fraunhofer. He made them by winding fine wire about two parallel screws cut with fine threads. They are now made by ruling, with a diamond-point, a polished surface, such as glass or speculum metal. The unruled portion acts as an aperture for light, which is transmitted through the grating or reflected from its face. All the best gratings of the world have been made by the late Professor Henry A. Rowland of Johns Hopkins University. Most of his gratings are ruled on speculum-metal with 14,438 lines to the inch; but a few of them have been made with as high as 42,000 lines to the inch. The largest error in the position of any one of these lines is said to be less than one one-hundred-thousandth of an inch. The first thing absolutely

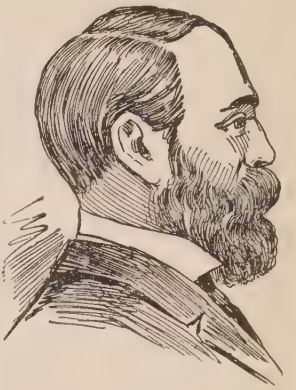
essential for the manufacture of a good grating is the manufacture and adjustment of a perfect screw. The reader who desires to learn how such a screw is made should consult Professor Rowland's article on the screw in the *Encyc. Britannica*. For a thorough discussion of the diffraction-grating see Preston's *Theory of Light*. Chap. 9.

Diges'tion in plants is essentially the same process as in animals. It consists in producing such chemical changes in insoluble foods that they become soluble in water, and consequently fit for absorption or transfer; or, when already soluble, in reducing them to simpler forms. There are no special digestive organs in plants comparable to the alimentary canal of animals, with its connected glands; and likening the leaves to the stomach is misleading. Digestion is usually accomplished by the action of enzymes (which see) or ferments secreted by the living protoplasm (See SECRETION.) In some cases these enzymes are produced in special glands; in others they are formed by the same cells that have other functions. Digestion often occurs outside the plant-body, as when the embryo secretes diastase (see ENZYMES) to digest the starch stored around it; or when a fungus digests the cellulose of a cell wall which it is penetrating. Or digestion may occur within the plant-body, as when the starch stored in a potato-tuber is digested in order to be transferred to the growing regions, or the starch-granules formed in a leaf are digested to be carried away to places of use or storage.

Dijon (*dē'zhôn'*), the former capital of the old duchy of Burgundy and the chief city of the French department of Côte d' Or, is situated on a plain at the foot of Mt. Afrique, 1,916 feet in height. It is an important place as a part of the inner line of French defenses, and the neighboring hills are crowned with strong forts. It is a well-built town, with broad streets and open squares, boulevards and beautiful surroundings. The Gothic cathedral which dates from the 13th century, has a spire 301 feet high. Dijon, known to the Romans as Dibio, passed in the 5th century from Burgundy to France. In the 9th century it was ruled by its own counts. In 1007 it was united to the duchy of Burgundy and made its capital. It became French territory in 1479. It yielded to a German army in 1870. Population, 76,847.

Dike. See JETTY.

Dilke (*dĭlk*), **Rt. Hon. Sir Charles Wentworth,** an English statesman and author, was born at Chelsea, Sept. 4, 1843. He graduated at Cambridge, and was soon after called to the bar. He published in 1868 a description of his travels in the United States, Australia and New Zealand under the title, *Greater Britain*. He was elected to Parliament in 1868, was under-secretary for foreign affairs and also president of the local-government board under Gladstone. In 1886 his connection with a divorce case prevented his reelection to Parliament, but his influence was still felt through his writings. His essays, collected under the title of *The Present Position of European Politics*, were first published in the *Fortnightly Review*. He has also published works on the British army, army-reform, imperial defense and the British empire and a work entitled *Problems of Greater Britain*. In 1892 he was again returned to Parliament.



SIR CHARLES DILKE

Dillon, John, Irish Nationalist member of Parliament and leader of what is known as the Plan of Campaign, was born at Dublin in 1851, and entered the British Parliament in 1880 as member for Tipperary and since 1885 has sat for East Mayo. He has suffered imprisonment twice (in 1881 and in 1891) for treasonable offenses. He at one time was a close ally of Parnell, and later actively opposed him. He succeeded Mr. Justin McCarthy in 1896 as leader of the Nationalists, and is known "for his intense religious fervor and his transparent sincerity," though neither political party in the House of Commons has cared to endorse his attitude as an Irish agitator.

JOHN DILLON, M. P.

Dinwid'die, Robert, governor of Virginia from 1752 to 1758, was born in Scotland about 1690. His rule as governor was not successful, his ill-temper and avarice making him very disagreeable to his subjects. He was the first to suggest the taxing of the colonies to the British board of trade. He discerned Washington's military ability, and made him adjutant-general of one of the four military districts of Virginia. He died in England in 1770.

Diocletian (*dī'ō-klē'shan*), **Valerius Diocletianus,** a Roman emperor, was born in Dalmatia in 245, and reigned from 284 to 305. He entered the army and held important commands under the Emperors Probus and Aurelian. After the death of Numerianus he was chosen to succeed him by the troops at Chalcedon. With his reign began a new form of government in Rome. He appointed Maximian as his companion in authority, styling him Augustus, and soon after he appointed Constantius Chlorus and Galerius as subordinate rulers, each with the title of Cæsar. Each of the four rulers had a different capital and governed a different region. In 305 Diocletian, being worn out by work, resigned his position as emperor and went to Salona, in Dalmatia, where he died eight years later. His reign has become memorable for the persecution of the Christians.

Diœcious Plants (*dī-ē'shŭs*). Those in which the staminate and pistillate flowers occur on different plants. See DICHOGAMY.

Diogenes (*dī-ŏj'ē-nēz*), a famous Greek philosopher, lived from about 412 to 323 B. C. He and his father were caught adulterating coins, and compelled to leave their native city of Sinope. He went to Athens, where he got rid of all of his dress and furniture, except his cloak and purse and a wooden bowl, because he believed the more things a man has the greater are his wants. He even threw away the bowl, when he saw a boy drinking from the hollow of his hand. He went to Cynosarges, where he lived in a cask, and in order to harden himself he used to roll in hot sand in summer, and in winter he embraced snow-covered statues. He afterward made a voyage and was captured by pirates, who sold him as a slave in Crete. His master took him to Corinth to conduct the education of his children, and he became famous there. Once Alexander the Great came to see him at Corinth and asked him if there was any favor he could do him. Diogenes replied that the only thing Alexander could do for him was not to stand between him and the sun. Alexander was so struck with his answer, that he is said to have cried: "If I were not Alexander, I would be Diogenes." Diogenes died at Corinth, and a pillar was erected to his memory.

Dionysius (*dī'ō-nĭsh'ĭ-ŭs*), **The Elder,** an ancient ruler of Syracuse in Sicily, was born about 430 B. C. When Sicily was invaded by the Carthaginians, he became a general in the service of Syracuse, which was then a republic. In the year 405, he made himself tyrant or ruler of Syracuse. He later continued the war against the Carthaginians, and was at first defeated, but afterward gained a complete victory. He also engaged in many other military expeditions, and was one of the most distinguished rulers of his time. Not content with his military renown, he wrote poems and tragedies, and at one time gained a prize at Athens for a work on tragic poetry. He died at Syracuse in 367 B. C.

Diplomatic Service, that branch of a government's service which has to do with political relations with other nations. It aims to secure between the home-nation and any other nation such understanding as will make for their independence, peace and mutual benefit, but particularly for advantages to the home-nation. The diplomatic serivce seeks to secure its ends without resort to force. It works for such agreements as treaties, alliances and trade-reciprocity. Its work is constructive and educational. The agents of the diplomatic service are (1) ambassadors, (2) ministers plenipotentiary and envoys extraordinary, (3) ministers resident, (4) *charges d' affaires* and (5) secretaries of legation and *attachés*. These agents and their order of ranking were agreed upon by the Congress of Vienna in 1814, and have been quite generally adhered to. These various agencies have developed from the early messenger-service between sovereigns and governments, and were inevitable because something must always be left to the good sense of the messenger. The early heralds or ambassadors carried special messages, but it finally became obvious that advantages would come from having a representative on the ground. The Congress of Westphalia, held in 1648, is usually regarded as the starting-point of diplomacy in the modern sense.

Dipper. See BEAR, GREATER and LESSER.

Directory, the name given to the executive department of the French republican government by the constitution of 1795. There were in France two legislative bodies like our senate and house of representatives. The directory was composed of five directors, elected by the upper legislative house, corresponding to our senate, from a list of names proposed by the lower body, which corresponded to our house of representatives. One of the number retired each year and a new one was elected. Under their management France was very successful in war, but they did not succeed in quieting internal disturbances, nor did they agree among themselves. Three of the directors, of whom Barras was the leader, managed to get the other two removed and new ones appointed. Many other such changes took place, Barras being the only one who remained a director during the four years the directory lasted On Nov. 9, 1799, Napoleon succeeded in abolishing the directory, and practically became ruler of France, at first under the title of Consul.

Dismal Swamp, Great, a vast swamp in Virginia and North Carolina, about 30 miles long and 10 wide. The soil is black

and spongy, and covered with stagnant pools during most of the year. In the center is Lake Drummond, 6 miles long and 3 wide, the surface of which is 21 feet above the level of tide-water. The swamp is covered with forests of cypress, juniper, gum and cedar, and in its drier parts with beech and oak. Two large canals run through it, on which are carried great quantities of lumber for shipbuilding, railroad-ties, shingles, etc. The great swamp and several smaller ones near were noted hiding-places for escaping slaves before 1865.

Disper'sion, as used in physics, is a phenomenon which occurs when a beam of light composed of different colors is made to pass through a prism or through a diffraction-grating. When a beam of sunlight falls on a glass-prism, we find that the red, yellow, green and blue rays are each refracted in different directions. Dispersion for any particular substance is measured in the following manner: Consider any ray of light which is deviated by the prism through an angle D, and another ray whose deviation is D+d D. Then

$$\text{Dispersion} = \frac{d\,D}{D.}$$

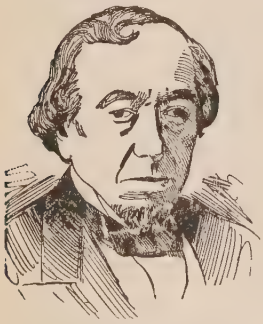
It may be shown that, in the case of a thin prism for which the refractive indices of the two rays differ by d μ,

$$\frac{d\,D}{D} = \frac{d\,\mu}{\mu^{-1}},$$

and hence the dispersion is measured also by the fraction $\frac{d\,\mu}{\mu^{-1}}$.

The explanation of dispersion lies in the fact that in any one medium, except ether, light-waves of different lengths travel with different speeds.

Disraeli (*dĭz-rā'lĭ*), **Benjamin,** created Viscount Beaconfield in 1876, and a great English novelist, was born at London in 1804. He devoted himself for a time to literature and in 1826 published his first novel, *Vivian Grey*, which was quite popular. Others of his novels are *Contarini Fleming*, *Henrietta Temple*, *Coningsby*, *Sybil*, *Tancred*, *The Young Duke*, *Lothair* and *Endymion*. His works were widely read, because many of them accurately described real persons in the society of his time. In 1837 he was elected to Parliament. His first speech was a failure, the house refusing to listen to him; but as he sat down he said: "I shall sit down now, but the time will come when you will hear me." He gradually became noted as an opponent of Sir Robert Peel, and, after the death of Lord Bentinck in 1848, he became the leader of the protectionist party in the house of commons. In 1852 he was appointed chancellor of the exchequer in the ministry of Lord Derby, and accepted the same position in 1858 in the new Derby ministry. Once more, in 1866, he joined Lord Derby in his third ministry, and was the main author of the reform-bill, which became law in 1867 and gave the right to vote to nearly a million men who had not been able to vote under the old law. Disraeli became prime-minister in 1868, but was defeated in a vote on Gladstone's bill regarding the Irish established church, and resigned in the same year. In 1874 he once more became prime-minister, and was specially occupied with the foreign policy of the country. He resigned in 1880, and died at London on April 19, 1881. See his *Life*, by Hitchman; also monographs by Brandes, Kebbel and Froude. His father, Isaac, was a famous literary antiquarian, writing such interesting books as *Curiosities of Literature*.



BENJAMIN DISRAELI

Dissent'er. The term dissenter has come to have in English history a very definite meaning. It refers to those who dissent from the doctrines of the Church of England, and it emphasizes the view, not that they differ from the church and thus are heretical or schismatical, but that they differ from the sentiment of the English people as it is organized in that church. A dissenter, moreover, is one who is bold in declaring his difference or opinion and in acting accordingly. Burke, in his great speech on American conciliation, speaking of New England as "the dissidence of dissent," thereby signified the resolve of New England's people that in matters of principle and conscience they would not submit to the government of the nation. The dissenting spirit is often referred to under the term: the Nonconformist conscience. In general it has stood for a stricter code of morals than that which is current among the English aristocracy, for strict subservience to biblical teaching and for anti-imperialism. It has been accused of narrowness, of displaying more zeal than enlightenment and of applying abstract principles without regard to the facts of the case.

The earliest dissenters are the Lollards who in Richard II's reign attacked the immorality, worldliness and superstition of the Church of Rome; they came into conflict, thereby, with the national government in the reigns of Henry IV, V and VI. The typical dissenting spirit was aroused in the reign of Henry VIII by the translation and printing of the Bible by

Tindale. The persecutions suffered by the reformers were inflicted by the national and not merely by the clerical leaders. Throughout the Reformation we find men who dissented from the opinion then dominant in the councils of the nation, either going too far in their Protestantism or declining for conscience' sake to follow as far as the national government had gone. In 1558, on the ascension of Elizabeth to the throne, English Protestantism took virtually its present character, and the national church in its independence was firmly established. In 1563 the 39 articles of the English Church were made the test of conformity. Since then a dissenter is any Englishman who boldly asserts that those articles are not in conformity with the Bible and, therefore, are not to be accepted. As the reading of the Bible spread, the number of those who found cause for dissent increased and came to include all classes of people. These were known by the common name of Puritan; and they found their most perfect expression in the stern yet cultured mind of the poet, Milton, and in the fervor of the "inspired tinker," John Bunyan. It was dissenters who formed the backbone of the party that overthrew Charles I, and it was dissenters who established the colonies of New England and Pennsylvania. The extreme spirit of dissent is found in the Quakers. The Independents (Congregationalists), who included Cromwell, Milton and most of the great Puritans, upheld freedom of belief. The Presbyterians desired a national church and general conformity, but to the opinions which they held and not to those current in the Church of England.

The Independents have developed both into what are now the Baptist churches and into the Congregationalists. In 1730 the Congregationalists, Presbyterians and Baptists united for the protection of their civil and religious liberties, under the name of the Three Denominations. In 1739 John Wesley inaugurated the movement which rescued millions in England from the drunkenness and debauchery that were then sweeping the country, bringing them to the fold of the Christian church through the gates of Methodism. For the Church of England was then closed to all missionary zeal; and John Wesley was compelled to organize a separate church. Methodism not only added immense numbers to the ranks of dissenters, but it gave them renewed spirit. The Methodists are now the most numerous of English dissenters. They have been a powerful factor in giving England Sunday-schools and common schools.

The dissenters aided greatly in the expulsion of the Stuarts and in the establishing of a Protestant and constitutional monarchy under William III and his successors. Since the Church of England still possesses certain peculiar privileges, such as sending its bishops to the House of Lords, the dissenters are determined to secure the disestablishment of that church and the placing of all religions on an equality before the law.

Distilla'tion, a process by which substances which are made into vapor at different degrees of heat are separated from each other, or those which can be made into vapor are separated from those which cannot. The usual method of distillation is by means of a covered boiler connected by a tube with a condenser. Suppose that it is wanted to separate two substances from each other, it being possible to heat one into vapor but not the other. The substance being put into the boiler and heated, that part which can be vaporized rises and passes through the tube at the top into the condenser, which is a box kept cool. The coolness of the condenser lowers the temperature of the vapor and it condenses into liquid, just as steam does on the inside of the cover of a kettle. This principle is used in preparing alcoholic liquors, the more easily vaporized parts of the fermented juice of fruits and grains being separated from the rest, in the form of alcohol, which keeps the flavor of the juice from which it is made.

District of Colum'bia, the territory containing the national capital (Washington City), is bounded on the north, northwest, east and southeast by Maryland and on the west and southwest by the Potomac River and Virginia. Its area is 60 square miles, though originally the area was 100 square miles. It was originally ceded to the United States by Maryland and Virginia in 1788 and 1789. The Virginian portion and the city of Alexandria were given back in 1846. Slavery was abolished in the District in 1862. The affairs of the District are now managed by three commissioners under the direction of Congress, and the citizens have no vote. Half of the District's expenses is paid by the general government, the other half being raised by taxation on the property of the citizens. There also are a court of the District of Columbia, with six judges, and a police-court with one judge.

The climate is mild in winter but the summers are long, hot and oppressive to most people, owing to the humidity. Manufactures are not common, printing and publishing being the chief industry. Besides the public schools, there are many educational institutions of different sorts, most of which are in Washington. Among them are Georgetown College, Columbian University, Howard University, the Smithsonian Institution and the National Museum. Population, 366,631.

Diver, a water-bird, famous as a diver, commonly called the loon. It is found on both hemispheres, and during the breeding-season frequents ponds and lakes of fresh water, but after the breeding-season is over it seeks the seacoast and salt water. The webbed feet are remarkably far back on the body, and these birds are very awkward on the ground, but they are good flyers and unusually fine swimmers and swift divers. They are difficult to shoot. They are large, solitary birds, seldom more than one pair occupying a lake. The voice is loud and harsh. In June they lay two or three dark, olive-colored eggs in a rude depression in the ground near the water.

GREAT NORTHERN DIVER

Di'ving. The art of diving to great depths under the water to bring up pearls, corals and sponges has been practiced in the Indian seas from very early times. Stories are told of these divers remaining under water for from two to three minutes. In modern times mechanical arrangements of different kinds have been invented to enable divers to stay longer under water. The most important of these is the diving-bell. This was used in quite ancient times, but it was not until the 18th century that it was so improved as to be of any great value. It is a large bell of iron which sinks by its own weight. The air in the bell keeps the water from filling it, but the farther down the bell goes, the greater is the pressure of the water, so that the air in the bells is continually compressed into a smaller space. By attaching a rubber hose to the top of the bell and continually pumping air with a force-pump, the water is kept from rising in the bell. Inside of this bell, therefore, men can breathe and can search for pearls on the bottom of the sea or do anything else under water. Another apparatus used by the divers is the diving-dress or armor. It is an india-rubber suit, with a metal helmet, having pieces of glass in front to enable the diver to see. Lead soles are used for the shoes in order to make the diver sink. A tube is fastened to the helmet through which air is supplied by a force-pump at the surface, while superfluous air escapes through a valve in the face-plate. Other forms of diving-armor are also used. While going down through the water, the diver suffers from severe pain in the ears and over the eyes, but this stops as soon as he touches the bottom. Divers have been known to work at a depth of 201 feet; but 150 feet are as deep as it is safe to work.

DIVING-DRESS AND DIVING-HELMET

Dix, Dorothea Lynde, an American philanthropist and author, was born at Hampton, Me., April 4, 1802, and died at Trenton, N. J., July 19, 1887. She established a school for girls in Boston, and later gave much of her time to helping criminals, the insane and the poor. In 1834 she went to Europe to investigate the methods of treating these classes, and three years later visited nearly every state in the Union, her exertions being the means of establishing many state insane asylums. During the Civil War she was superintendent of hospital-nurses at Washington. She published several works, among them *The Garland of Flora* and *Prisons and Prison-Discipline.*

Dix, John Adams, an American soldier and politician, born at Boscawen, N. H., in 1798. He entered the army and became a captain in 1825, but soon resigned, studied law and settled in New York, soon becoming secretary of state for New York. In 1845 he was chosen to fill a vacancy in the United States senate, being a Democrat. In 1860 he was appointed secretary of the treasury, and it was he who issued the famous order to the commander of a revenue-cutter at New Orleans: "If any one attempts to haul down the American flag, shoot him on the spot." In 1861 he became major-general of volunteers, and later had command of an army corps. He was in command at New York in 1863 during the riots which then took place; and later had charge of the department

of the east. In 1866 he became minister to France; and in 1870 he was elected governor of New York by the Republicans. He died at New York city, April 21, 1879.

Dix, Morgan, American divine and author, was born at New York Nov. 1, 1827, the son of John A. Dix and Catherine Morgan. He was educated at Columbia College and the General Theological Seminary. For almost fifty-three years he was identified with Trinity Church, New York, of which he became assistant-minister in 1855 and rector in 1862. His activities were great as a churchman, and he also was an extensive author. Among his principal publications are *Commentaries on Romans* and on *Galatians and Colossians; The Calling of a Christian Woman; The Seven Deadly Sins; The Sacramental System;* and *Lectures on the First Prayer-Book of Edward VI.* His death occurred April 29, 1908.

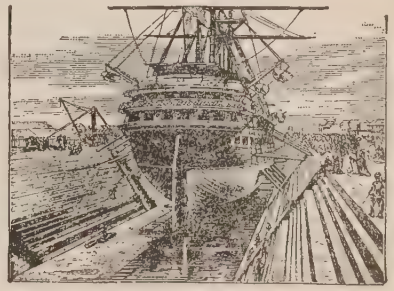
MORGAN DIX

Dix'ie, a name given to the southern states. The name is derived from the popular song which sings of the happiness of Dixie's Land; and it is said that this happy region was given its name of Dixie's Land by slaves, because of the kindness to his slaves of a man named Dixie.

Dnieper (*nē'pēr*), a river of Russia and the most important river of Europe, next to the Volga and the Danube. It rises at the foot of Voldai Hills, in the government of Smolensk, flows south to Kiev, and finally into the Black Sea. It is about 1,200 miles long, and has several large tributaries, all of which are navigable; but, owing to many natural obstructions, it is not so important for commerce as it otherwise would be. The Russian government has greatly improved the course of the river by taking away many of the obstructions and by building canals around some of the cataracts. Canals connect the Dnieper by means of its tributaries with the Duna of Niemen and Bog, and thus join the Black and Baltic Seas. It passes through the richest provinces of Russia, and at Smolensk is covered with ice from November to April. There is a fine suspension bridge, half a mile long, at Kiev. The river was anciently known as the Borysthenes, and was thought to be the largest river in the world, except the Nile.

Dniester (*nēs'ter*), a river of Galicia, in eastern Europe, rises in the Carpathian Mountains and flows southeastward into Russia, entering the Black Sea about 30 miles south of Odessa. It is about 760 miles long, the chief towns on its banks being Mohileff, Bender and Akerman. Navigation is interrupted by falls between Yampol and Bender, though an artificial channel permits the passage of small boats. In February and June there are severe floods, often raising the level of the river 20 feet and causing great damage along its banks by the swiftness of its current.

Docks are basins for receiving ships, and are of two kinds, wet and dry. A wet dock is a basin in which ships load and unload their cargoes. Where the tides cause great changes in the level of the water, the dock is walled in and the water inside is thus kept at one level. Dry docks are of two kinds: the stationary dock and the floating dock. They are used in order to get at that part of ships which is under water, in order to mend them. The stationary or graving-dock, as it is sometimes called, is made of stone or timber, the sides rising in steps. The entrance is closed by gates, and after the ship has entered the dock the water is pumped out, leaving the ship resting on timbers arranged for that purpose. Floating docks are of various sorts, their object being to raise vessels out of the water. One of these, which may be given as an example, is made of iron in the form of a long box without ends. Inside are compartments filled with water, causing the whole to sink below the bottom of the ship, which is then towed on to it. The water is then pumped out of the compartments, thus allowing the dock to rise with the ship upon it. Among the finest wet docks are those at London Liverpool, Havre, Antwerp and Brooklyn, N. Y. All ports of any size have dry docks. One of the most wonderful feats of navigation was the towing of the dry-dock *Dewey* from the United States to Manila *via* Suez Canal, in 1907. See *Harbors and Docks*, by L. F. Vernon-Harcourt.



DRY DOCK

Dodd'ridge, Philip, an English clergyman, was born at London in 1702. He studied theology at the Academy of Kibworth, and several years later took charge of the academy himself, moving it to Northampton, where he also was pastor. At

this academy most of the Protestant ministers who dissented from the Church of England during the middle of the 18th century were educated. After managing the institution for 20 years, Dr. Doddridge sailed to Lisbon for the sake of his health; but died there soon after, in 1751. He wrote several works, especially *Rise and Progress of Religion in the Soul*, which were popular in his lifetime. See his *Correspondence and Diary*.

Dodge, Mary Abigail, an American author, born in Hamilton, Mass., about 1830. She was an instructor in the high-school at Hartford, Conn., and afterwards became a governess at Washington, D. C. She also wrote frequently for magazines under the name of Gail Hamilton, derived from the last syllable of her middle name and the name of her birthplace. She wrote several books, among them *Country Living and Country Thinking*, *Gala Days*, *Wool Gathering*, *Red Letter Days* and *A Battle of the Books*. She died in Massachusetts on Aug. 17, 1896.

Dodge, Mary Mapes, an American writer for young people, was born at New York city in 1838. Her story of *Hans Brinker or the Silver Skates*, was very popular and gave her quite a reputation as a writer of stories. It was afterward published in England and France. She also wrote many magazine-articles and a book called *Rhymes and Jingles*. Two others of her books are *Donald and Dorothy* and *Along the Way* the latter a collection of poems For some time she was one of the editors of *Hearth and Home*, but became editor of *St. Nicholas* when it was founded, a position which she held until her death on Aug. 21, 1905.

Dodge, William Earl, an American philanthropist, was born at Hartford, Conn., in 1805. At 21 years of age he went into business in New York and became a successful importer and manufacturer. He was a member of many benevolent and religious societies; and was elected a Republican member of Congress in 1866-67. The Protestant college at Beirût, Syria, was founded largely through his help; and he always was very prominent in charitable work of different kinds. He died at New York in 1883.

Dodge, William E., Jr., born 1832, is the son of the late William Earl Dodge. Mr. Dodge is director of the U. S. Steel Corporation, and is interested also in mining. He has wide and deep scientific interests; and takes a leading part in many benevolent enterprises. Mr. Dodge is president of the Evangelical Alliance and chairman of the International Committee on Arbitration. He is a member of the executive committee of the Metropolitan Museum of Art and of the New York Botanic Garden. He is also a member of the New York Academy of Sciences, the Linnæan Society of New York and the American Historical Association; and is vice-president of the American Museum of Natural History. Mr. Dodge is the donor of Earl Hall, the admirable social and religious center of student-life at Columbia, to Columbia University.

Dodgson, Charles Lutwidge, better known by his pseudonym of Lewis Carroll, an English clergyman, mathematical lecturer and writer, was born in Cheshire in 1832, and died in Surrey on Jan. 14, 1898. He wrote a number of mathematical works of considerable repute, but to English and American popular readers he is best known by his delightful Lewis Carroll books—*Alice's Adventures in Wonderland; Through the Looking Glass;* and *The Hunting of the Snark*. These works, with their amusing illustrations, are likely, as they deserve, to be of undying memory to little folks.

Dodo, a bird of curious and ungainly form, extinct since the close of the 17th century. The dodo was a large, clumsy bird weighing from forty to fifty pounds, found only on the islands of Mauritius, Bourbon and Rodrigues. By its structure it was related to the living pigeons. It had a round, fat body, a tail consisting of a few curly feathers, a large head and an enormous bill, the upper part of which was hooked over the lower. Having very imperfect wings, it was unable to fly and was killed by the sailors in large numbers for food. After dogs and hogs were introduced into the islands, about 1644, they began killing the young of the dodo and thereby hastened its extermination. A living dodo was in London in 1638, and was sketched by a number of artists.

DODO
(From painting in the Belvedere, Vienna.)

Dog, a domestic animal found among all peoples, civilized and uncivilized. Dogs were domesticated before historic times, the first animal domesticated by man. The dog was the only animal the North American Indians had tamed before the coming of white men. Their remains are found with those of man of the stone-age. The Egyptians, Greeks, Romans and earlier peoples all had dogs. It is likely that they are descended from wolves and jackals, but they were tamed so long ago that the parentage of the dog is uncertain. The dogs of uncivilized tribes are still close to the wild state, but the dogs themselves

1 German Shepherd Dog 2 Scotch Collie 3 Spitz Dog 4 Doberman's Terrier 5 Airedale Terrier 6 Irish Terrier 7 Poodle 8, 9 Smooth Haired and Shagged Pinchers 10 Dwarf Spitz 11 Maltese Dog

DOGS—Plate I

12 German Bulldog 13 Mastiff 14*a* Shorthaired 14*b* Long Haired St. Bernard 15 Newfoundland 16 Bull Terrier 17 English Bulldog 18 French Dwarf Bulldog 19 Pug Dog

DOGS—PLATE II

1 Greyhound 2 Russian Hound 3 Scotch Hound 4 Fox Hound
5 Fox Terrier 6 and 7 Short and Longhaired Dachshund
8 Spaniel

9 Bloodhound 10 Bloodhound 11 Pointer 12 Irish Setter
13 English Setter 14, 15 and 16 Shorthaired, Wirehaired
and Longhaired Setters

become civilized in association with a higher grade of people. There now are many varieties, adapted to different purposes, that have been produced by breeding. The chief races of dogs are the wolf-dogs, the hounds, the spaniels, the mastiffs and the terriers. The lowest of the wolf-dogs are those of the Esquimaux, being little more than partly-tamed wolves, while the shepherd-dogs, which belong to the same race, are the most intelligent of all the breeds of dogs. The Scotch collie is one of the best of the sheep-dogs. The Newfoundland and the Great St. Bernard are usually classed with the wolf-dogs. The former seem to be descended from the wolf-dogs of Labrador, and, as their name implies, were imported from Newfoundland. They are expert swimmers, and have saved many children from drowning. The St. Bernards are large, powerful animals. They are kept by the monks of the monastery of St. Bernard, situated on one of the Alpine passes between Switzerland and Italy, and are trained to rescue travelers lost in the snow. By their keen scent they are able to find those that are lost and by loud barking attract the attention of the monks. The hounds make a large group. The bloodhound, a large, powerful animal, with a remarkably keen scent, is now rare, It was used to track criminals and to pursue fugitive warriors. It is said that Robert Bruce escaped from bloodhounds by walking a long distance in a stream of water, and then pulling himself out by an overhanging branch, thus breaking the scent. They were also used by the Spaniards in the conquest of Mexico and Peru. Those that were used in the south in the pursuit of runaway slaves were different from the Old World variety in having shorter ears and a more pointed nose.

The Siberian bloodhound is the dog called the Great Dane, and is now often seen as an imported variety in various parts of the United States. The staghound was a large, fleet animal, slimmer than the bloodhound. It was used in the chase of deer, but is rare now, as the stags of the forests of the Old World have become rare. The foxhound has taken the place of the staghound in England as a dog of the chase. Although smaller, by careful breeding it has reached a high degree of strength and swiftness. The harehound is smaller still, and is used in hare and rabbit hunting. The pointer is supposed to be descended from an old Spanish breed of the hound. It has been trained to stand, and point with its nose, when game is scented, and it, above all others, is the sportsman's dog. The ungainly *dachshund*, with its long body and short, crooked legs, is the German badger-dog. The greyhound stands in a class by itself and is not a true hound. The Irish and English varieties differ as to the quality of their hair. They hunt by sight, and have almost lost the power of scent. They are very slender and noted for speed. The spaniels make another race of dogs. Among them are the common spaniel, the water-spaniel and the setter. These are hunting-dogs, and the group also includes various fancy-pets. The mastiffs form still another race. They have a short broad nose, an enormous head with powerful jaws and a heavy body. The color of the common mastiff is usually buff. It is now used chiefly as a watch-dog, and is rarely met with in its pure form. The bull-dog and the pug belong to the mastiff race. The former is the fiercest of the domestic dogs. It has a thick bullet-head and a scowling expression of the eyes. It is smaller than the mastiff, but very compactly built, and its color is usually brindled or black and white. It is the most brutal of the dogs, and when once its teeth are set it can scarcely be made to let go. The pug presents the appearance of a bull-dog on a small scale, but is timid and good-tempered. The terrier is one of the oldest dogs of Great Britain. It is a bold, active, intelligent little fellow, ordinarily of a black and tan color, with short hair, and is very successful in catching rats and other small animals. Other varieties are the Scotch terrier, the fox-terrier, the Skye terrier, the Irish terrier and the Airedale terrier The bull-terrier is a cross between the terrier and the bull-dog.

In Belgium the dog acts as the poor man's horse; singly, in pairs, by threes and fours, they are harnessed to carts, and often made to draw very heavy loads. In Alaska and parts of the far north the sledge-dog is a creature of prime importance; since the Klondike excitement every school-child has become familiar with the "huskies," without whose aid gold-seeker and explorer would be sadly handicapped. These dogs show marvelous endurance, and are able to draw light loads with great speed. The typical Eskimo dog very closely resembles the gray wolf in appearance, and is a mixture of good and bad qualities; both cowardly and courageous; is an irredeemable thief as regards food, but can abstain for a long time. He seems to take great pride in being of service, and in the sledge-train carries himself as if proud of his task. These dogs do not bark or bay like the civilized dog, their utterance being the wolf-howl.

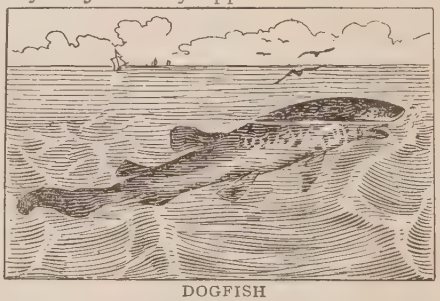
The character of the dog as a pet might well be dwelt on; its faithfulness, unselfish devotion, courage, endurance, intelligence and docility. Though a favorite household associate, few know how to treat this companion and playfellow; as a rule it is overfed, and is neglected in the matter of cleanliness. Hodge in *Nature Study and*

Life proffers this brief advice: "For an adult dog one meal a day, given in the evening, is generally better than two or three. It should consist of dog-biscuit or the coarser table-scraps, bread-crusts, brown bread, oatmeal, bones with not too much meat and vegetables. In severe weather or with much exercise in the open air a dog needs to be fed oftener and to have more food. The best indication as to whether the feeding is proper is the condition of the animal. He should be neither lean nor fat, but *sleek*. One should be able to take up a handful of soft, loose skin anywhere on the dog's body. A gnawing-bone is the dog's tooth-brush, and he should be kept well-supplied at all times, both for business and amusement. Too much meat and a lack of cleanliness are apt to give rise to offensive odors, the 'doggy' smell of animals not properly cared for. Fleas are the great burden of a dog's life. To kill every flea on a dog it is necessary only to lather him completely with some mild, clean soap, let it stay on for two or three minutes, then rinse in clean water or let the dog take a swim." Watson's *Dog Book* and *The Pet Book*, by Anna Botsford Comstock of Cornell University (Comstock Pub. Co., Ithaca), a complete and delightful cyclopedia on the choice and care of pets.

Dog-Days is the name given in ancient times to the period of greatest heat in summer, because along the Mediterrenean this is of nearly the same duration as that in which the Dog-star rose at the same time with the sun. The joining of these two was supposed to have an evil influence on the earth. The period of the rising of the Dog-star with the sun is very indefinite and uncertain. In modern times dog-days are sometimes reckoned from July 24 to August 24, and sometimes from July 3 to August 11.

Doge's Palace, The. In Genoa as well as in Venice there is a palace once owned by the dukes or doges of the city; but while the former dates only from the 17th century and relatively is an insignificant building, the doge's palace at Venice still is a splendid and interesting structure, though it was begun in 1300. Between 800 and 1300 three or four palaces were built for the doges and destroyed. The present building was then started, facing the sea and bordering the Rio del Palazzo Canal. Friezes from the earlier building were inserted in the new one. This palace was some distance from the famous church of St. Mark, but slowly its front was so extended as at length to touch the church. Its rear lines the canal; and there is included an oblong court. The building is but three stories high. For an adequate account of its beauties one must study Ruskin's *Stones of Venice*, Vol. 2; but we may note a few points of interest. The exterior and interior have both suffered much from fire, from robbery by conquerors and from clumsy efforts to restore columns, statuary and paintings. But there remain the striking and unique façades, the beautiful marbles of the exterior walls and a profusion of delicate and elaborate sculpture, allegorical in character, presenting virtues, vices, the ages of man and similar subjects. On the third floor, in the great council-chambers, hang many splendid and famous paintings, including some by Tintoretto. The Bridge of Sighs, celebrated in poem and story, was built about 1590 to join the palace with the new prison then erected on the other side of the Rio del Palazzo. Of course its tragic fame arises from the shortness of the passage from the splendid abode of power to the dark and hopeless dungeons of the prison. But before 1590 the victims of the doge's authority had suffered under the floors of the palace itself. The fascination of the building can be understood only through study of the history of Venice and its institutions, which lent themselves so readily to extremes of splendor and misery.

Dog'fish, the common name for a group of small salt-water sharks and also for a fresh-water fish. The smooth dogfish without a spine and the spiny dogfish with a spine on each of the two dorsal fins are very abundant along the Atlantic coast. They are slate-color above and whitish below, and attain a length of about three feet. They are migratory, going into the southern waters in winter and returning north in the spring. Late in May and early in June they appear on the southern



DOGFISH

coast of Massachusetts, and work northward around Cape Cod and up to the coast of Maine. They are caught on hooks for the oil contained in their livers. When abundant, they are troublesome to the fishermen, eating their bait and driving away other fish. They carry from two to twelve eggs in oviducts, and the young are hatched within the body of the parent. The fresh-water dogfish (*amia*), often called the bowfin, belongs to the ganoids, a group of fishes with very hard, enamel-like scales.

Dog-Star or **Sirius,** the brightest star in the heavens, belongs to the constellation of

the Great Dog. Its light is estimated at six times as great as that of Vega or Arcturus. In ancient times it was described as of a reddish color, but its light now is white. The spectroscope shows that it is traveling away from us at a rapid rate and that its temperature is probably very much higher than that of our sun. From photometric measurements it appears that the light emitted by Sirius is probably 40 times as great as that emitted by our sun. For an interesting account of the color of Sirius see three articles by Professor See in *Astronomy and Astrophysics* for 1892.

It was discovered by Alvan G. Clark that Sirius is a double star having a very faint and close companion.

Dog'wood. Species of the genus *Cornus* which includes about 30 species, mostly in the temperate regions of the northern hemisphere. They usually are trees or shrubs, but sometimes herbs. The most showy species is the native *C. florida*, which is the flowering dogwood appearing in early spring. Its bark is said to contain the same substance as found in quinine. The wood is very hard and heavy, being used for tool-handles. The ordinary bush-forms, with red and greenish twigs and white, bluish or red berries, are common throughout the United States.

Dol'drums. The term doldrums probably is a latinized form of the word dull. In the early days of ocean-navigation it was applied to the regions near the equator where for months at a time there are intense heat and a dead calm, except for occasional squalls and light, very variable winds. These areas were dangerous to sailing-ships, especially until their exact location was known. Food and drink might give out before the vessel escaped from the calm. The area of doldrums moves north in July and south in January. In the Atlantic it moves between the equator and 10° north, in the Pacific between 15° south and 15° north. At any time the area covers about 5° of latitude. It is supposed that from these areas start both the tropical hurricanes and those currents of the ocean that flow from the equator to the poles.

A person who is in a depressed or sullen mood, with some tendency to gusts of temper, is said to be in the doldrums.

Döllinger (*dĕl'lĭng-ẽr*), **Johann Joseph Ignaz,** a German theologian, was born at Bamberg in 1799. At 24 his reputation as a writer led to his appointment as professor of church-history at the school of Aschaffenburg. Three years later he was appointed professor at the University of Munich. He became prominent in church-matters, and wrote several historical works, in all of which he upheld the authority of the pope. He was very prominent in the struggle which took place in the Roman Catholic church about the adoption, as a church doctrine, of the infallibility of the pope, belonging himself to that party of the Catholics, called the Old Catholics, who were opposed to it. Döllinger wrote a large number of works, many of them of great value. He died at Munich in 1890. Among his works are *Paganism and Judaism*, *The Church and the Churches*, *The Religion of Mohammed* and *The Reformation.*

Dolphin, the common name for a number of small whales, also called porpoises. They are not fishes but mammals. They are dusky above and whitish below, and attain a length of six feet and more. The snout is prolonged into a slender beak, and the mouth is provided with teeth—an unusual thing among whales. They swim rapidly, and are often seen from the deck of ocean-steamers, swimming on the surface and leaping slightly from the water. The name dolphin is also applied by sailors to a true fish that changes its colors when taken from the water, and is on that account celebrated in literature.

COMMON DOLPHIN

Domatia (in plants). Minute shelters of various sorts formed usually upon the under side of leaves and used as dwelling-places by the mites. They are generally formed by hairs roofing over an angle of the veins, or sometimes by outgrowths, folds and pits.

Dome is usually understood to imply a round roof like an inverted bowl, though the shape is not always that of a bowl. Most of the great domes have an opening or eye at the top, on which stands a little dome, called a lantern. Until recent times they were always built of masonry—stone, brick or tiles—but wood is now often used, as in St. Paul's cathedral in London. The domes of St. Peter's at Rome and of the Florence cathedral are built of stone. The finest dome in America is that of the capitol at Washington. It is made of cast-iron, and has a statue of Liberty at the top. Many consider it superior to the dome of St. Peter's.

Domenichino (*dô-mĕn'ē-kē'nô*) or **Domenico Zampieri,** a celebrated Italian painter, was born at Bologna in 1581, the son of a shoemaker. He studied under several masters; and was known as a quiet, studious scholar, who never went into society except to study the faces of people in order that he might paint better. In Rome he painted for some of the prominent men of the time and gained a great reputation, but he

excited so much jealous opposition among other painters that he left Rome for a time. He was recalled by Pope Gregory XV, who appointed him principal painter and architect to the papal palace. After 1631 he was in Naples where he opened a school; but he was persecuted by the painters of Naples who had formed the so-called cabal of Naples, to keep out all other painters. Their persecution is supposed to have caused his death, which occurred at Naples in 1641.

Domesday (or **Doomsday**) **Book,** the name given to an old record which contains a description of all the lands of England in the time of William the Conqueror. Commissioners were sent out by William, and were met wherever they went by representatives of the people, who told them the name of each estate or manor and the name of its owner; the amount of land, how much was wooded, how much was pasture, and how much meadow; how many mills and how many fishponds belonged to it; and the value of the whole in the time of Edward the Confessor as well as of William. The number of tenants on the land was also given, and the amount of their cattle and live stock, as well as the number of serfs. The king thus obtained a complete account of the wealth of the kingdom and of the military strength of each county in case of war. A record was also made of the lands the possession of which was in dispute. Domesday Book, thus, is now a valuable record for the study of the history of ancient England.

Domestic Art, a subject of study to which the attention of teachers has been directed principally during the last decade, is usually held to include the various household industries and such art-work as may be applied in the home. There, however, is no reason in the nature of the term, why all the branches of domestic economy, including cooking, hygiene, nursing, etc., should not be included under domestic art. At present it is customary to speak of the latter group of studies as *domestic science*, an unfortunate distinction of terms. Let us first consider domestic art in its narrowest conventional meaning. Its field is large still, including, as it does, the place of the household-arts in the development of society with reference not only to their present but to their primitive conditions and the process of their evolution. Domestic art takes into account the place of the work of women in society and the artistic and scientific preparation which is desirable for the due fulfilment of that work. A college-course in domestic-art may include such technical subjects as braiding, netting, basketry, weaving and sewing, with the attendant dyeing and cleansing of textiles, drafting, pattern-modeling, dress-making, millinery and embroidery. It may also include the development of household-manufactures, such as textiles, with their cultural and economic effects; household-art, economics, organization and management; and art-work, for the purpose of cultivating taste and skill in designing for these crafts. This list is taken from the course in domestic art at Teachers' College, New York, where fundamental courses in educational psychology, history and principles and allied courses in domestic science, English, geography, history, manual training and mathematics are also offered to students of domestic art.

Domestic science, which may be regarded as essentially one subject with domestic art, includes certain scientific studies in biology, physiology, hygiene and household chemistry; technical studies in the nature, production, manufacture and manipulation of foods; household-mechanics and sanitation, laundering, home-nursing and emergencies; and social and economic studies in history and household-art and economics. These studies should not obscure practical efficiency, but assist it. It is felt that domestic art and domestic science, as taught in elementary and secondary schools, may do much to improve social conditions and especially to educate foreigners into American habits and modes of life. For this reason it is apt to be one of the principal features of settlement-work; but its value is also widely recognized in elementary and grammar schools, secondary schools, normal schools and colleges.

Domestic Science. The same principles that led to the introduction of manual training into the American public schools for boys led to the institution of domestic-science departments for girls. We are at last learning the lesson that the common work of life may be done both scientifically and artistically and that thus the plane of our living may be greatly elevated.

In the manual-training high-schools of our larger cities domestic science (including domestic art) usually constitutes an important department. Some of the main branches taught under this heading are sewing, dressmaking, millinery, history of costume, drawing, household-design, cooking, dietetics, purchase of commodities, house-sanitation, laundry-work, general household-economics and the care of young children. Emphasis is placed upon a mastery of the underlying principles rather than upon the acquirement of mere skill in the practice of the art.

The opportunities in this line at the present time are very promising. Schools and colleges in many parts of the country are opening new departments of domestic science and calling for well-equipped teachers. There also is a growing demand for experts in dietetics in our hospitals and philanthropic institutions. A normal-school course in domestic science lasts three years,

and includes educational subjects, such as psychology and the history of education, in addition to the regular technical work.

Many institutions in our large cities are now offering excellent courses in domestic science. A few of the most noteworthy are the Teachers' College, the Manhattan Trade-School for Girls and the Girls' Technical High-School in New York; Pratt Institute, Brooklyn; the Manual-Training High-School of Kansas City; Downer College, Milwaukee; the State College of Agriculture at Ames, Iowa; and the Minnesota Agricultural College.

Domingo, St. See HAITI and SAN DOMINGO.

Dominic, St., founder of the Dominican order of monks, was born at Colahorra, a village of old Castile, in 1170. At 15 he proceeded to the university at Palencio. The story is told that, while there, he sold his clothes to feed the poor in a time of famine. In 1204 Dominic first became prominent. He then went with the bishop of Osma on a journey to Denmark, and on the way came in contact with the Albigenses of southern France. The legates, whom the pope had sent for their conversion, failed, and were on their way back to Rome, when Dominic met them and with a few followers began the work which the legates had given up. The pope sent a crusading army into the country, and Dominic seems to have gone with it. After the crusade against the Albigenses Dominic formed a society of monks (see DOMINICANS), and in the course of five years the society spread all over Europe. Dominic died at Bologna in 1221.

Domin'icans, the name by which the disciples of St. Dominic became known. The order was founded in 1216. Its members took a vow to eat no meat, to wear no linen clothes, to fast and to preach continually. They also took the vow of absolute poverty and of obedience to their head; and went about preaching and teaching, begging their living as they went, and thus were often called the Begging Friars or Brothers. In England they were called the Black Friars on account of the black cloak they wore. They soon spread through Europe, and many of the greatest teachers and preachers of the middle ages belonged to the order. See *Life of St. Dominic* by Archbishop Alemany and *The Coming of the Friars* by Dr. Jessopp.

Domitian (*dŏ-mĭsh'ĭ-an*), **Titus Flavius Domitianus,** the third of the Flavian emperors of Rome, was born at Rome in 51 A. D. When his father, Vespasian, was declared emperor, Domitian was given the administration of Italy by the soldiers until his father's return from the east; but he so abused the power, that, when his father returned, he excluded Domitian from all share in public affairs; and during the rule of Titus, his brother, he still abjured public life and gave himself up to pleasure. On the death of Titus he was declared emperor by the soldiers, and began his rule by attempting a reform in morals and by passing many good laws. In war he was not successful, and was defeated by the Dacians. He became jealous of the better success of his general, Agricola, in Britain, and in consequence summoned him to Rome and probably had him killed by poison. In 93 a revolt of his soldiers on the upper Rhine caused him to become suspicious of everyone, and from that time he became very cruel, great numbers of prominent men being put to death. He was murdered at Rome in 96. It perhaps was in his reign that John the Apostle was banished to Patmos.

Don, a large river in European Russia. It rises in Lake Ivan and flows generally in a southerly direction until it empties into the Sea of Azov, 1,325 miles distant. In some places the river has a width of 1,800 feet. Navigation is bad, except during May and April, when the water is high; and the river is usually closed with ice from November or December to March or April. It is visited in the lower part by two floods each year—one called the cold water, being caused by the melting of the snow along the lower half of its course; the other called the warm water, being caused by the melting of the snow near the upper part of the river. A canal connects the Don with the Volga.

Donatello (*dōn'ȧ-tĕl'lō*) or **Donato,** a distinguished Italian sculptor, was born at Florence in 1386. He learned the goldsmith's trade, which then included all kinds of work in bronze, such as the making of statues, but later he became a sculptor and also a painter. One of his first achievements in sculpture was the statue of St. Mark at the Church of St. Michele in Florence, and it also is one of his best. Others of his great works are *The Baptist*, *David*, *Judith* and *St. George*. The chief man in Florence, Cosmo dei Medici, was his friend and patron. Donatello was a hard worker; 40 examples of his art now exist, there being many more thought to be his, but not certainly known to be so. He died at Florence in 1466. The name also is that of the hero of Hawthorne's *Marble Faun*.

Don'elson, Fort, an historic post in Tennessee on the Cumberland River, 12 miles east of Fort Henry. It was strongly fortified by the Confederates during the Civil War, and in 1862, when held by General Floyd with 15,000 troops, was attacked by Commodore Foote, who was driven back. But the forces of General Grant, coming up from the capture of Fort Henry, defeated

the Confederate force, which came out of the fort to meet them. General Floyd and a part of his force escaped during the night, and the following day General Buckner, who was next in command, surrendered with about 14,000 men.

Don Giovanni is an *opéra bouffe* in two acts whose words are by Da Ponte and the music by Mozart. First produced at Prague, Oct. 29, 1787, and then in London at King's Theater, April 12, 1817, it met with extraordinary success. In one respect this opera is preeminent: All its moods and situations are essentially musical. "There is scarcely a feeling known to humanity which is not expressed in some one of the situations or characters." The overture was not begun until the evening before the first representation of the opera, —an extraordinary instance of rapid composition.

Donizetti (*dŏ'nē-dzĕt'tē*), **Gaetano,** an Italian musical composer, was born in 1797. He studied music under several masters, but when 20 years old entered the army. While garrisoned at Venice, he produced his first opera, and soon afterward, obtaining his discharge from the army, he devoted himself to opera-writing. He went to Paris, where his pieces were not very successful; but after gaining much applause at Naples he returned to Paris, and soon gained a great reputation. He received appointments at Naples and the court of Vienna; but a disease, brought on by overwork, affected his mind and he died in 1848. His masterpiece was *La Favorita;* others of his works are *The Daughter of the Regiment, Linda di Chamounix, Don Pasquale* and *The Martyrs.*

Dooley, Mr. See DUNNE, F. P.

Don Juan (*jū'an* Sp. *dōn hōō-ăn*), a mythical person, the story of whom originated in Spain and spread throughout most of the countries of Europe. According to tradition, Don Juan belonged to a prominent Spanish family in the time of Peter the Cruel, and lived a life of wild dissipation. In trying to carry off the daughter of the governor of Seville, he was met by her father, whom he killed. He afterward went to the town where the governor was buried, and challenged his statue to follow him to supper. The invitation was accepted, and after supper the statue carried Don Juan to Hades. To this story others of a similar kind were added at different times, Don Juan always being a villain, whose evil life made him laugh at spiritual things. The story was made the plot for plays by Spanish dramatists, and was afterward made the basis of dramas and operas in several countries of Europe. The story, in one form or another, is also to be found in many poems and novels.

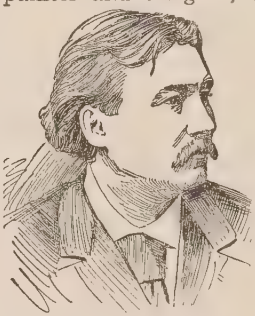
Donkey. See Ass.

Don Quixote. See CERVANTES SAAVEDRA.

Dora d'Istria. See KOLTSOF-MASALSKI, PRINCESS.

Dorcas. (1) A gazelle, with long, slender horns, found in Syria and the Sahara. (2) A woman, mentioned in *Acts* ix:39, who made coats and garments for the poor, and was lamented by the widows. (3) Hence, benevolent societies of women who have banded themselves together, usually in connection with a church, to provide clothing for the poor.

Doré (*dō'rā'*), **Paul Gustave,** a French painter and designer, was born at Strassburg in 1833. His first success was in landscape-painting, but he soon after began designing illustrations for books. He illustrated an edition of *Rabelais* in 1854 and the legend of the *Wandering Jew* in 1856. These works increased his reputation, and he soon after illustrated a work of Balzac and also drew many of the illustrations for a French journal. Other works which he illustrated are *Don Quixote*, Taine's *Travels in the Pyrenees*, *Fables* of La Fontaine; Milton's *Paradise Lost, History of the Crusades* and Dante's *Works.* He also painted a number of pictures, but is best known as a designer. He died at Paris, Jan. 23, 1883. See *Life* by Miss Roosevelt.


GUSTAVE DORE

Doremus, Sarah Platt, born at New York in 1802, was noted for her efforts in missions. She was of great assistance in the mission to the French peasants of Canada, and soon after became prominent in work for females in the New York city-prison. She was prominent in the relief of the sufferers from famine in Ireland in 1849, and in 1855 she helped to organize the Woman's Hospital Association. Her labors in behalf of the sick and wounded soldiers during the Civil War entitle her to remembrance. She died at New York in 1877.

Doria (*dō'rē-ä*), **Andrea,** a famous Genoese admiral, was born in 1468. He belonged to a noble family, and adopted military life. In middle life he entered the service of Francis I of France, who gave him command of his fleet in the Mediterranean, and in 1524 he defeated the fleet of Emperor Charles V near Marseilles. Objecting to some of the plans of Francis, he retired from his service and entered that of Charles and delivered his own city, Genoa, from the French. Instead of making himself sovereign in his own country,

he helped the citizens to form a constitution and a republican government that existed until 1815. He was called the Father and Liberator of his Country. He afterward engaged in an expedition against the Turks, and also aided Charles V in the conquest of Tunis. He died at Genoa in 1560. See *The Conspiracy of Fieschi* by Celesia.

Dorians, one of the two foremost races of the ancient Greeks, the other being the Ionians. They claimed to be descended from Dorus, a son of Hellen, and settled in the Peloponnesus. They founded Sparta, Argos and Messenia. Their colonies were planted in Crete, Cyrenaica, Sicily and Asia Minor. The Dorians differed from the Ionians in their simplicity of life and stern and rough but solid character, which showed itself in their manners, laws and dialect as well as in the unadorned simplicity of their architecture. The Ionians, on the other hand, were noticeable for their eloquence and delicacy of taste and for their love of luxury.

Doric Order. See ARCHITECTURE and GREEK ARCHITECTURE.

Dorion, Sir Antoine Aime, Canadian statesman and jurist, was born in the province of Quebec in 1818, and died at Montreal, May 31, 1891. Educated at Nicolet College, he early studied law and in 1842 was admitted to the bar. From 1854 to 1861 he represented Montreal in the old Canadian Assembly, and Hochelaga he represented up to the era of Confederation in 1867. In the Dominion legislature he sat for five years, and was then elevated to the bench of Lower Canada (Quebec province), becoming chief-justice, with a seat in the privy council. He was knighted in 1877. Sir Antoine was in politics a Canadian Liberal, and leader of the French-Canadian *Rouge* party.

Dormouse, a small animal of squirrel-like habits, confined to the Old World. It is

DORMOUSE

related both to the mice and the squirrels, but in structure is intermediate between them. It lives in trees and bushes, feeding on nuts and berries, and sits erect on its haunches like a squirrel when eating. It lays up a store of food for winter, and when cold weather comes it curls up in its nest and sleeps. On warm days it is likely to wake, eat and fall asleep again. Its name signifies the sleeping mouse. Dormice are tamed and kept as pets. In the United States the common white-footed mouse is often called dormouse.

Dorr, Thomas Wilson, was born at Providence, R. I, in 1805. Under the old charter of Rhode Island, only men who had a certain amount of real estate, and their eldest sons, had the right to vote. In 1841 the party in favor of general suffrage formed a new constitution, and chose Mr Dorr as governor. The government of the state, which was chosen according to the old charter, resisted, and Dorr was arrested, convicted of treason and sentenced to imprisonment, but was pardoned in 1847. He died at Providence, Rhode Island, in 1854.

Dorsiven'tral Habit (in plants), the habit in plant-bodies which exposes two surfaces to different conditions. For example, in a liverwort one side of the body rests upon the soil or some other substratum, and the other is exposed to the light. As a result the two surfaces develop very much unlike. Ordinary leaves are dorsiventral, one surface being directed upward, the other toward the ground. The contrasting term is radial, in which all sides of an organ are exposed alike, as in an erect stem.

Dortmund (*dôrt'mŏont*), a town of Germany in the Prussian province of Westphalia, about 50 miles northeast of Cologne. Near it are many coal-mines, in which several thousand persons are employed. Iron-ore also abounds, and many forges and blast-furnaces have been built. The manufactures include tobacco, iron, steel, machinery, porcelain, oil, flour and woolen, linen and cotton-fabrics. There is a large number of breweries. Among the chief buildings are the large railway-station and the old historic churches. During the middle ages Dortmund was a free town, having its own government. Population, 175,577.

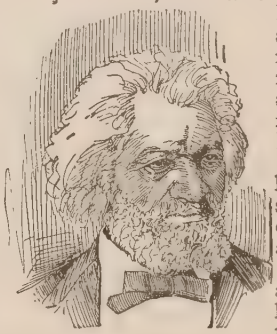
Douglas, a thrifty city in Cochise County, Arizona, in which two of the great smelters of the country are located. There is but one smelter in the world larger than the Copper Queen at Douglas, and the Calumet and Arizona follows closely in its output. In one year these two smelters produced 15% of the entire copper-output of the world. The ore is supplied from mines surrounding the city, but principally from Bisbee. These smelters give employment to 2,000 people, and besides copper they produced gold, silver, lead and other minerals. Other industries are a large cement-plaster works,

a brewery and a stone-quarry. Douglas has a fine system of public schools, several churches, a Y. M. C. A. building and an excellent library, which was presented by the Copper Queen Company. Douglas has gas and water-works, an electric light and power-plant, electric street-railways and the service of the El Paso and South-western Railroad. Population, 6,437.

Doug'las, an ancient noble family of Scotland whose family annals date from the time of William de Douglas, who lived about 1175–1213. From him was descended "the good Sir James," who fought with Bruce at Bannockburn, and, after Bruce's death, fulfilled his last request, to carry his heart to the Holy Land. William Douglas, Earl of Liddesdale, and Sir William Douglas, descended from "the good Sir James," were among the most famous warriors of their time. Other members of the family obtained the earldoms of Angus and Morton. The power of the family was once so great that it was commonly said. "No man may touch a Douglas or a Douglas' man; for if he does he is sure to come by the worse." The family continually engaged in feuds and warfare on the border, especially with the Percy family. A famous member of the family was Archibald, called Bell the Cat. At a meeting of nobles who were debating about a plan to get rid of one of the king's favorites and considering who should do it, he started up, exclaiming: "I will bell the cat." He tried to persuade King James IV not to make the invasion of England, which ended in the battle of Flodden; and soon after the great defeat he died heartbroken. The Douglas family is now represented by the earls of Selkirk.

Douglas, Stephen Arnold, an American statesman, was born at Brandon, Vermont, in 1813. His early youth was one of poverty; but he managed to spend three years at Canandaigua Academy, having the study of law in view. In 1833 he went west and settled in Jacksonville, Ill., where he entered on the practice of law and was so successful that he was chosen attorney-general of the state. He soon after was elected to the legislature, and in 1840 became secretary of state for Illinois. He was judge of the Illinois supreme court from 1841 to 1843, when he resigned and was chosen to Congress as a Democrat; and there he at once became recognized as one of the ablest men of his party. He strongly urged the admission of Texas into the Union, and supported President Polk in the War with Mexico. He was opposed o slavery; but believed that Congress did not have the right to restrict it to any part of the country. Hence he was strongly opposed to the celebrated Wilmot Proviso, which was intended to prohibit slavery in any territory that might be gained from Mexico in a treaty of peace On the question of permitting slavery in the territories Douglas argued that the people who had settled in any particular territory should decide for themselves. This was the origin of the expression: Squatter Sovereignty. Douglas was elected to the senate in 1847, and in 1854 he introduced the Kansas-Nebraska bill, which provided that their own citizens should determine whether these territories should become free or slave-states. In 1860 the Democratic party split into two divisions, one of which nominated Douglas for president, and the other John C. Breckenridge. The ensuing election resulted in favor of Lincoln. Douglas was strongly opposed to secession, and delivered several addresses on the subject after the outbreak of the Civil War. He died at Chicago, on June 3, 1861. See *Life of Douglas* by Sheehan and *Life* by Flint.

Douglass, Frederick, an American orator and journalist, once a slave, was born near Easton, Md., about 1817. He ran away from his master in 1838, and took up his residence at New Bedford, Mass. In 1841 he began to lecture against slavery, and became well-known as an orator. In 1845 he published an account of his life, and later went to England, where he lectured eloquently against slavery to large audiences. In 1847 he published a journal at Rochester, N. Y. When the war broke out, he urged the employment of colored troops and helped to organize regiments of them. In 1870 he became editor of the *New National Era* at Washington. He was appointed minister to Haiti by President Harrison. See his *Life and Times* by himself. He died on Feb. 20, 1895.



FREDERICK DOUGLASS

Doukhobors. See DUKHOBORS.

Douma. See DUMA.

Douro (*dōō'rō*), a large river of Spain and Portugal. It rises on the frontier of the province of Soria, and flows in a westerly direction until it empties into the Atlantic near Oporto. It is 500 miles long; but navigation is difficult because of rocks and sandbanks, and it is little used for commerce. It has many tributaries, the most important being the Pisuerga.

Douw or **Dow, Gerhard,** a celebrated Dutch painter, was born at Leyden in 1613. He learned the art of glass-painting, and afterward became a pupil of Rembrandt for some years. He became for a time a portrait-painter, but was slow at his work and had trouble in getting anyone to sit

for him. He was very exact in every detail in his paintings, it being said that he spent five days painting a hand, and his work was so fine that he had to make his own brushes. His best works are *The Dropsical Women*, *The Evening School* and *The Village Grocer's Wife*. He died in 1675.

Dove, a name commonly given to small varieties of pigeons, but no clear distinction can be made between doves and pigeons.

Do'ver, the capital of Delaware, and county-seat of Kent County, is about nine miles west of Delaware Bay. It has a state-house and a large state-library. There also are fruit-packing and evaporating-houses, flour-mills, glass, carriage and other manufactories. It is the center of a large fruit-growing district. Population, 3,720.

Dover, a port of England 70 miles from London, on the southeast coast of Kent, on the Strait of Dover. It is 21 miles from the French coast, and is the English seaport nearest to France. It lies in a low valley or basin between high chalk-cliffs, and is guarded by Dover Castle, which is built on the heights east of the town. The town is said to have been founded by the Romans. Elaborate fortifications are also built on the height to the west. Dover is the chief port which connects England and France, and steamers run daily from it to Boulogne and Calais. The city has many relics of ancient times, among which are several old churches. It has a salubrious climate, and is frequented as a health resort. The total tonnage, entered and cleared in 1910, was 3,665,705 tons. Population, 35,000.

Dover, N. H., a city of southeastern New Hampshire, close to the Maine boundary and about 12 miles northwest of Portsmouth. It is the county-seat of Strafford County and is situated on Cocheco River, from the falls of which it derives its water-power. Being founded in 1623, it is one of the oldest towns in the state. Its site is hilly. It possesses good schools, churches, an excellent public library and other public buildings. It has large cotton mills besides manufactories of leather belting, woolen cloth, flannels, machinery, shoes, and sashes and blinds. Population, 13,247.

Dover, Strait of, the channel which separates England from France and joins the English Channel with the North Sea. It is bordered by chalk-cliffs on the English side, and they also occur in places on the French coast. At the narrowest point its width is 21 and its length 24 miles.

Dow, Neal (1804-97), to whom is due the prohibition-law of Maine, was born at Portland in that state. He was famous as a temperance-orator and the founder of temperance-societies in Canada and England as well as in the United States. He fought in the Civil War, and for the greater part of a year was a prisoner in the hands of the Confederates. In 1880 he was the prohibitionist candidate for the presidency.

Dowden, Edward, LL. D., D. C. L., an Anglo-Irish critic, man-of-letters and professor of English literature at Trinity College, Dublin, was born at Cork, May 3, 1843, and educated at Dublin University. He was one of the commissioners of national education in Ireland. His literary industry was very great, for he was author not only of the best *Life of Shelley* extant, but of perhaps one of the most informing as well as critical works on Shakespeare, as to whose works he was an accomplished scholar and editor. His other works embrace a *Life of Southey*, and editions of Southey's, Wordsworth's and Shelley's poetical works; *New Studies in Literature;* and a *History of French Literature.* He died in Dublin, April 4, 1913.

Dowling, The Right Reverend Thomas J., was born in Ireland in 1840, but was educated at St. Michael's College, Toronto. He was parish-priest at Paris, Ontario, for 22 years, administrator of the diocese of Hamilton in 1883, bishop of Peterboro in 1887, and was transferred to the bishopric of Hamilton in 1889.

Doyle, Sir Arthur Conan, British novelist and physician, was born at Edinburgh, Scotland, May 22, 1859, and was educated at Stonyhurst, in Germany and at Edinburgh University, where he studied medicine, graduating in 1881 and taking his M. D. degree in 1885. While practicing at Southsea, he began to write for *Chamber's Journal* and other periodicals. He then essayed fiction at some length and published *A Study in Scarlet*, *Micah Clarke*, *The Sign of the Four* and *The White Company.* The success of these novels led to Dr. Doyle's abandoning medicine professionally. He then produced a clever series of detective stories, *The Adventures of Sherlock Holmes*, after which appeared *The Exploits of Brigadier Gerard*, *The Tragedy of the Korosko* and other tales. He has also written verse and a play, *A Story of Waterloo*, which was successfully staged by Sir Henry Irving. Dr. Doyle has been a great traveler. When he visited South Africa and the scenes of the struggles between Britain and the Dutch burghers, the result was a work entitled *The Boer War.* He was knighted in 1902.

A. CONAN DOYLE

Draco (*drā'kō*), a Greek legislator and the author of Athens' first code of laws, was born

about 621 B. C. He probably simply put in writing the laws which were customary in his time; but these laws seem harsh and cruel to people of later times. Draco has had to bear the blame of their severity. His laws ordered how a child must be brought up from its birth, and educated, and what his duties were when he became a man. Plutarch says that death was the penalty for nearly every crime. The writing of the laws was probably intended to prevent the archons, who were at the head of the government, from abusing the rights of the people. Nothing is known of Draco's life.

Draft-Riots. These riots resulted from the enforcement of the conscription act, passed March 3, 1863, to fill up the ranks of the army, which was no longer adequately supplied by volunteers or by the state-drafts. Congress divided the north into enrolment-districts, each under the charge of a provost-marshal; he in turn was responsible to the provost-marshal-general, an officer of the war-department. By this act all "able-bodied male citizens of the United States" and foreigners intending to become citizens, between the ages of 20 and 45, were enrolled and became liable to three years' military service. There had been riots in Pennsylvania and Wisconsin over state-drafts, but the most serious were those in New York City. On Monday, July 13, 1863, after the lots had been drawn for about half an hour, a mob of some thousand men began to hurl brickbats and paving-stones into the marshal's office. The crowd increased, the drafting-office was destroyed, and the building fired. The few soldiers available were routed, and the police overpowered. Other draft-offices were set on fire, and the firemen prevented from putting out the blaze. Other houses then were burned, belonging to people whom the crowd thought responsible for the war and the draft. Then, as the crowd grew larger and fiercer, it seized upon many negroes, cruelly beat them, and in many cases killed them, burning the bodies. For one night New York City was practically at the mercy of the mob. On Tuesday, July 15, thieves joined the mob, and matters became worse. Governor Seymour addressed them from the City Hall in a weak speech. Towards evening about 800 troops joined the weary police, and some headway was made. On Wednesday it was announced that the draft had been suspended in New York City and Brooklyn. The mob subsided. Militia at the same time arrived and began to rake the streets with cannon wherever occasion offered. By Friday all rioting was at an end. About 1,000 were killed, chiefly members of the mobs. The damage to property was about $1,500,000.

Drago Doctrine. A theory advanced in 1902 by Dr. Luis Drago, Argentine minister of public affairs, as an extension of the Monroe doctrine, to the effect that the debts of a nation should not be collected by its creditor-nation by force. It was modified in 1907 to the effect that the claims should be argued through the courts of the debtor country up to the Hague Tribunal, whose decision, if unfulfilled, may permit of such forcible measures. Dr. Drago published his theory at the time when England and Germany were trying to exact their dues from Venezuela. It was not received very favorably at first, but was finally submitted to the Hague Conference for approval and adoption.

Dragon, the name given to a lizard found in the East Indies, about seven or eight

DRAGON

inches long. The skin along the sides of the body, between the legs, is spread out into a kind of parachute, and, these animals, which live among trees, may be seen shooting through the space from tree to tree, with the parachute expanded. They feed upon insects. Their color corresponds pretty well to that of the bark of the trees, but they have little or no power of changing color. In ancient and medieval times the dragon was a fabulous monster, either a serpent or a hideous winged and clawed creature, guarding some treasure or spreading havoc by occasional visits, and against which gods, heroes and knights combated.

Dragon-Fly, the name of a group of insects, common all over the world, with four large transparent wings, that are net-veined. There are several varieties, and some have bright metallic colors. In the United States they are commonly called darning-needles, and are said by children to be able to sting, sew up the ears or do some other physical harm; but they have no sting and are entirely harmless to man. They have very large, rounded eyes, composed of several thousand elements united, and this gives a huge size to the head. Their mouth-parts are strong-biting jaws, and they devour many insects which they catch while on the wing. They are abundant about ponds and

still waters, in which their eggs are laid. The larva lives in the water, feeding on insects and very small fish, which are caught by a peculiar claw. When ready to transform,

DRAGON-FLY

the nymph crawls out of the water on the stem of a water-plant, its outer case splits open along the back, and the perfect insect issues from it.

Drainage, the means of escape for free water of the soil, which are (1) that afforded by the slope of the land, which may carry off much of the rainfall before it can sink into the ground, and (2) that given by underground facilities. On rather level land the excess water not absorbed by the soil itself tends to sink until it meets an impervious layer, and to spread on this until it escapes through some hillside as springs. If there is no such escape, the water remains as an underground lake saturating the soil to a level more or less below the surface. This level or water-table tends to rise according to the wetness of the season, and to fall with the dryness, or proportionably to the facilities for escape by artificial drainage. If the water-table is too near the surface, the air necessary for plant-roots is excluded from the soil. This tends to make roots, as, for instance, of grains, spread out in the upper layer of earth instead of striking deep. If the district is later subjected to drouth, the plant fails of its water-supply as the water-table descends below the layer of soil occupied by the roots. Artificial drainage is accomplished (1) by open ditches or (2) by covered drains. Shallow surface-drains, made by plowing, serve to carry off only surface-water. Dug ditches may also serve as outlets for covered drains. Covered or under drains are made by placing large stones, poles, brush or tiles at the bottom of a trench and covering with soil. They are made from 25 feet apart in heavy soils to 200 feet apart in light soils, and from three to four feet deep, the depth increasing with the distance between the drains. Tiles are made of clay, burnt like brick, are hollow and more or less cylindrical. They are more lasting than wood and more cheaply laid than stones, unless the latter are in the field and have to be gotten out of the way. The benefits of under-drainage are these: (1) By removing the free water to a lower level, the soil occupied by capillary water (see CAPILLARITY) is deeper, and more soil is available for plant roots. (2) Soil can more readily absorb rain-water and prevent surface-wash. (3) It aids ventilation of the soil, and so aids it in warming earlier in the spring and later in the fall. (4) It allows fertilizers to be carried into the soil instead of being washed off when the land has a slope. (5) It aids in various useful chemical changes. See King, *The Soil.*

Drainage-Canal. See CANALS.

Drake, Sir Francis, a celebrated English sailor, was born in Devonshire, probably about 1540, though some authorities give the date of his birth as 1539. He was educated by his uncle, Sir John Hawkins, and was brought up to a sea-faring life. At 20 he made a voyage to Guinea, and two years later he was captain of the *Judith* in the expedition of Hawkins to Mexico. When he came back to England, he had gained a great reputation, but had lost all he had invested in the expedition. Soon after, he plundered many of the Spanish settlements in South America, and marched across the Isthmus of Panama, where, by climbing a high tree, he saw the waters of the Pacific. In 1577, under the favor of Queen Elizabeth, he set out with five vessels, intending to pass through the Straits of Magellan and explore the waters he had seen from the Isthmus of Panama. All but his own ship were separated from him by the time he had passed the straits, but he went forward alone, plundered the Spanish settlements in Chile and Peru, and claimed California in the name of his queen. He tried to find a northeast passage to the Atlantic, but was driven back by the cold. Instead of returning to England by the way he had come, he determined to make a circuit of the globe, and having crossed the Pacific and Indian Oceans and sailed around the Cape of Good Hope, he reached England in November, 1580, nearly three years after he had set out. Soon after his arrival, the queen paid him a visit, and ate dinner on board his ship, after which she made him a knight. Five years later, as war had broken out between England and Spain, Drake captured several Spanish towns in the West Indies, and two years later he entered the port of Cadiz in Spain, and destroyed a great

SIR FRANCIS DRAKE

amount of shipping, which was being prepared for the Spanish Armada, a feat which he afterward called "singeing the king of Spain's beard." When the Spanish Armada attacked England in the following year, Sir Francis Drake was appointed vice-admiral under Lord Howard, and did gallant service. Some years later, in company with Sir John Hawkins, Drake led an expedition against the Spanish settlements in the West Indies; but, as the commanders did not agree, the expedition was not successful. His lack of success was the main cause of Drake's death, which took place in the West Indies in 1596. See *Life* by Barrow.

Drake, Joseph Rodman, American poet, born in New York City in 1795. James Fenimore Cooper and Fitz-Greene Halleck were his most intimate friends. Drake's longest poem is *The Culprit Fay*, his most popular short poem being *The American Flag*. Drake and Halleck formed a partnership, and together wrote many witty poems to the New York *Evening Post*, under the signatures, Crooker, Crooker, Jr. and Crooker & Co. Most of Drake's poems were written before he was 21. He died of consumption in 1820, at 25.

Drake University. Drake University is situated in Des Moines, Iowa. Founded in 1881, its attendance has increased steadily from 270 in 1882 to 1,843 in 1910. The university includes the colleges of liberal arts, law, medicine and the Bible. The graduates of Drake University have proved its worth. It is co-educational, and provides special facilities for courses peculiarly adapted to young women. Its endowment is about $342,000, and its income about $125,000. The value of the buildings is given as $307,000 and of the grounds, which include a fine stadium, $100,000. A Carnegie library, costing $50,000, has recently been completed. The president is Dr. Hill McClelland Bell.

Dram'a, a term applied to compositions designed to be acted on the stage. Dramas which are intended to cause laughter and good humor are called comedies, and those which rouse the deeper emotions, having a sad or terrible ending, are termed tragedies. There also are many dramas which strictly are neither one nor the other, but combine both elements. The drama probably had its origin in the union of dancing and singing, for most early nations have had rude methods of imitating actions on the stage. The people of India, China and Japan each had a drama of its own, but it is with the ancient Greeks that our real interest in the drama begins. It arose in Greece in connection with the worship of the gods, by hymns and dances and rites of various sorts. Soon, instead of a single person reciting a hymn or a comic song, a chorus, accompanied by instrumental music, with the aid of gestures and dancing, was used to reply to the single actor; and later the actor, instead of reciting to the chorus, who replied in song, addressed the leader of the chorus, who carried on a dialogue with him, the chorus coming in with songs at proper intervals. The most famous of Greek dramatic writers were the four dramatists, Æschylus, Sophocles and Euripides, whose tragedies are among the finest the world has seen, and Aristophanes, the great comedy-writer. Nor must Menander the comedian be forgotten. The Roman drama was derived from the Greek, but was not nearly equal to it. Plautus and Terence were the most celebrated of its writers. Of modern European nations, nearly all have long made use of the drama. During the middle ages the Greeks of Constantinople preserved the drama, and introduced it into Sicily and Venice before the church-drama of western Europe had begun. In the 12th century it became common to introduce short performances at banquets, and about the same time mystery-plays, as they were called, became common; they were scenes from the Bible, acted by priests on a stage built in a church or church-environment. Later, the so-called morality-play became common. It consisted of a fable which was directed against vice in general. The nation deemed for a long time to have the best dramatic writers was France. Her great writers, Corneille and Racine, followed the models of the Greek dramatists very closely, and their dramas are among the best in any language. In the writing of comedies the French probably stand at the head of the great writers of the world. Molière, their greatest comedy-writer, is unapproached in his best pieces by any writer except Shakespeare. In Germany the theater was simply an imitation of that at Paris until the time of Lessing. He was a writer of great originality, and taught his countrymen to develop their own literature. He was followed by a number of dramatists of the first rank, among whom Goethe and Schiller were far the greatest, Goethe being now considered by many critics to be, after Shakespeare, the greatest dramatist the world has seen. Italy and Spain have had many excellent dramatic writers, the most celebrated in Italy being Alfieri, Manzoni and Goldoni, and in Spain, Lope de Vega and Calderon. England has had fewer great dramatists than France, but her greatest, Shakespeare, is unapproached by any writer of any country, and Molière alone is equal to him in the writing of comedies. Other great dramatists of Shakespeare's time were Ben Jonson, Marlowe, Green, Beaumont and Fletcher and, in later times, Dryden, Wycherly, Congreve, Vanbrugh, Sheridan, Goldsmith and Lytton. See *English Literature* by Henry Morley; *Lectures on the Literature of the Elizabethan Age* by William Hazlitt; and the authorities on the modern drama.

Draper, Andrew Sloan, an American educator, was born at Westford, N. Y., June 21, 1848, and graduated at Albany Academy and Albany Law School. He set out in life as a practicing lawyer, and in 1881 was a member of the New York state assembly and a judge of the United States court of Alabama claims. He then devoted himself to educational work, and successively filled the offices of member of the Albany school-board, superintendent of public instruction at New York and superintendent of schools at Cleveland, O. In 1894 he became regent and president of the University of Illinois, resigning in 1904 to become commissioner of education of the state of New York. He has written largely on educational topics, American schools and American citizenship; on the powers and obligations of teachers; and on the responsibility and authority of school trustees. Among his published writings are *The Organization and Administration of City-School Systems* (1888), *American Schools and American Citizenship* (1891), *Public School Pioneering in New York and Massachusetts* (1892), and *American Universities and the National Life.*

Draper, John William, an American chemist and physiologist as well as author, was born in 1811 near Liverpool, England. He came to America in 1833, and studied medicine in the University of Pennsylvania. After graduating he was appointed professor of chemistry and physiology in Hampton-Sydney College, Virginia. Some years later he accepted a like position in the University of the City of New York, and in 1841 was appointed professor in its medical college. He discovered many important facts of spectrum-analysis, and made important discoveries in photography. Besides his scientific writings, he found time to write valuable literary works, his *Intellectual Development of Europe* being translated into most European languages; the *History of the American Civil War* has also been widely translated. He died in 1882.

Drawing. "Drawing is the act of moving anything in one's own direction." If the thing moved be a point capable of leaving a record of its course, the result is the drawing of a line. Drawing in art is the indicating of directions by the making of lines, these lines generally forming the contours of spots and representing the profiles of forms.

In its strictest sense drawing applies to lines only: thus, *outline drawing* means the expressing of form or contour by lines alone. More broadly, the term drawing designates any representation more or less in outline, even including the use of tones of gray or color, particularly when such tones are produced by lines or are dependent upon the limiting influence of them: as, *pen-and-ink drawing*, in which the depth of the tones varies with the number or area of the ink-lines upon the white paper; *charcoal-drawing*, in which the depth of the tones varies as the weight of the lines employed; *pastel-drawing*, in which the colors are ordinarily applied with crayon, stump or finger. In the latter two forms of expression the lines may or may not disappear with the completion of the work. *Water-color drawing* is a term falling into disuse with the changing methods of employing water-color pigments. Water-colors were formerly used largely for tinting pictures in pen or pencil outline, and are now used more independently. (See PAINTING.) *Wash-drawing* is a term employed by modern illustrators to designate work in monochrome water-color done without the use of opaque white.

Among artists the word drawing may refer (1) to the indicating of form or contour either in pictorial or plastic art with reference to truth, beauty, technical perfection or all of these; as, "the splendid drawing of Michelangelo's *David*," meaning the beauty and perfection of the contours, or (2) to form or contour itself when viewed from the standpoint of the artist; as, "the drawing of the branches against the winter-sky" referring to the appearance of the actual branches against the sky. Great masters of this particular aspect of art-expression which we call *drawing* include Pheidias, Botticelli, Michelangelo, Andrea del Sarto, Raphael, Holbein, Ingres, Puvis de Chavannes, Hokusai, Menzel.

In educational phraseology the term drawing is often applied to all work in art, though it really designates only one factor in certain forms of art-expression. This somewhat inaccurate use of the term is due to the supposed commercial value which first won for this form of art-expression its place in school-courses, but in most localities the work has now outgrown both this estimate of its value and the methods of teaching that went with it. *Mechanical drawing*, the making of drawings with the aid of instruments and according to certain accepted conventions for the guidance of workmen and scientists, is properly an aspect of construction rather than of art. In many schools mechanical drawing is now taught in the construction department. *Working drawings* are mechanical drawings, made to scale and presenting a sufficient number of views of the given object to show all the facts of its form. *Freehand drawing* is a loose term covering generally all drawing that is not mechanical, even including in some localities water-color painting, design and certain forms of construction. This term shows the disciplinary rather than educational light in which art was at one time held as a school subject.

Courses in drawing. Since drawing concerns itself largely with contours and edges, mere drawing is rather an abstraction, and in the interests of the children would take its place after color, a child's interest in the shape of

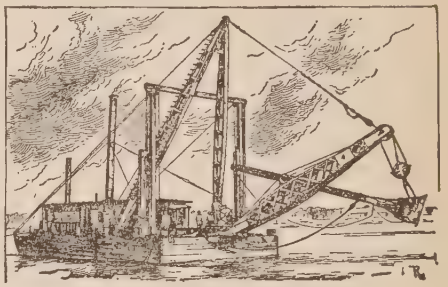
the color-spot coming with further development. Drawing for its own sake, or nicety of drawing, is a thing beyond his comprehension until he reaches the higher grades To lead into more refined drawing through his awakening interest in the shapes of the color-spots he has occasion to employ, both in his design and in his representative work, would seem to be a true way of recognizing both his capabilities and his interests

In the older art-schools it has been the practice to teach drawing by setting the student to work in charcoal or crayon from plaster casts of geometric or vegetable forms, or of fragments of the human figure, or even to have him begin by copying plates made from drawings of this kind, this work to lead ultimately to drawing from casts of the whole figure or of groups of figures, and thence to drawing and finally painting from the live model. The reverse order of work is now beginning to obtain, however, and in some modern art-schools students begin their study from the live figure in motion, and as knowledge of detail seems to become more necessary they turn to the cast, leaving the close study of the details of the figure to the last.

The educational content of drawing sums itself up about as follows: Drawing of itself may and probably will lead to an appreciation of beauty of line. It will also develop accuracy of vision. It demands a nice condition of muscular control, and it involves a complete acquaintance with the conventions of projection-perspective.

GEORGE WILLIAM EGGERS.

Dredging, the excavating or scooping out of soil, mud, sand or rock under water by a machine called a dredge. Dredging is used in deepening and widening the beds of rivers, canals, harbors. The forms of modern dredges are very numerous, different conditions requiring different forms A common form is that in which a large number of buckets or scoops is attached to an endless chain or a wheel. As the chain revolves, the buckets are filled and raised in succession and emptied at the top into a barge for that purpose. Another common form is the single scoop or dipper dredge. of the Osgood or other type. On a long arm, which can be let down and moved along the bed of the stream, is a scoop of suitable form, which can be thus filled, and when filled can be raised and emptied. Other machines include the clam-shell and oyster-dredge, the grapple and the suction-dredge, besides those used in deep-sea dredging. These latter collect samples of sea-bottoms, for the inspection of marine plants and animals. Another purpose of deep-sea dredging is to ascertain the nature of the ocean-floor, so as to determine its suitability for the laying of cables. Soundings for this and other purposes have been made, often at great depths, as in the explorations of the *Albatross*, of the U. S. Fish-Commission, which has made tests of the sea-bottom and brought up deep-sea life at depths varying from 4,000 to 5,000 fathoms. Modern dredges are operated by



A SCOOP-DREDGE

powerful steam-engines, and are strong enough to remove materials of any sort, even 70-ton boulders. Some dredges have a capacity of over 1,000 cubic yards an hour. Dredging is also done by means of streams of water maintained in pipes by centrifugal pumps. The material to be removed is mixed with the water and carried along the pipes to the point where it is to be deposited in nearly level beds. This method is adopted for sand and soft mud, and has been extensively used in Holland and in San Francisco harbor, where the dredged material is used to fill low ground. Under special conditions pneumatic excavators have been used. In these the materials are drawn into pipes by the suction due to a vacuum. Such an excavator was used in the construction of the great Tay bridge, Scotland.

Dreibund, The, or **Triple Alliance,** was a league between the European powers of Germany, Austria and Italy, formed for the purpose of mutual protection, in the case of attack upon any of them by other nations. The league was formed in 1882, and was afterward renewed. Prior to 1882, however, a league, known as the Dual Alliance, had been in existence since 1879, between Germany and Austria. In 1882, Italy joined the Alliance, which was then called the *Dreibund*. In the war of 1914 (v.p.635), Italy refused to join her Allies, claiming neither had been attacked.

Dresden (*drĕz'den*), one of the largest cities of the German empire and the capital of Saxony, is situated in the beautiful valley of the Elbe. The city lies on both sides of the river, the old portion on the left bank having narrow, gloomy streets; while the streets of the newer part are wide and regular. Dresden is often called the German Florence, because of its many objects of high historic value. Many of the churches are of historic interest, and the palaces are beautiful buildings, containing fine collections of celebrated works of art. The court-

1 2 3 4 5 6 7

8 9 10 11 12 13

14 15 16 17 18 19

DRESS OF ANCIENT PERIOD (SEE DESCRIPTION FOLLOWING)

20 21 23 24 25 26

27 28 29 30 31 32

33 34 35 36 37 38 39 40

DRESS OF MIDDLE AND LATER PERIOD UP TO 1880 (SEE DESCRIPTION FOLLOWING)

Dress. Description of the dress of various peoples and periods as shown in the two preceding color plates.

1. *Egyptian Man.* Time—last period, or nearing the end of the old Dynasty. Costume—long skirt-like garment made of linen or cotton. Large curled wig.

2. *Egyptian Woman.* Time—same as No. 1. Skirt-like garment with shoulder-straps. Broad, highly colored shoulder-straps made of painted linen or small colored stones and pearls. Large curled wig.

3. *Ancient Greek Woman of Peplos.* Costume—merely a square linen cloth, one end of which is lapped over and fastened with pins at shoulders—not covering the whole body.

4. *Greek Man shown in "Chiton."* A short, sewed undergarment of part linen material over which the "Himation"—the woolen garment was thrown.

5. *Greek Woman during Hellenistic Period.* Costume—a long linen, usually colored, sewed undergarment with girdle and shoulder-straps over which the "Himation" was draped in similar manner as worn by the men.

6. *Noble Roman in Tunic.* A short garment trimmed with two stripes of purple (clavus) and worn by senators and like officials and the (toga praetexta) a purple bordered robe draped as shown and worn by the highest officials.

7. *Roman Woman during the time of the Roman Empire.* Costume—similar to that worn by Greek women of late period. Long, usually white, sleeve garment (stola) over which when out of doors a colored robe was thrown. High, fancy coiffure.

8. *Byzantine Emperor.* Justinian. Costume—gold embroidered girdle, white undergarment with purple mantle trimmed with yellow squares (clavus)—to distinguish highest rank of nobility. Diadem of pearls. (Taken from Mosaic picture 2nd half of 6th Century in San Vitale in Ravenna.)

9. *Byzantine Empress.* Theodora, wife of Justinian. Costume—white robe with hem embroidered in gold and colored stones. Purple embroidered mantle. Diadem of pearls over which strands of pearls hang down to shoulders

10. *Frankish Nobleman.* Costume—long-sleeved skirt-like coat—the Roman tunic with clavi. Tight leggings—ankles wound as was customary in Frankish period. (Taken from a miniature, ending of the 9th Century.)

11. *Frankish Lady.* Costume—richly embroidered robe with wide white sleeves. Scarf of costly material draped over the head and shoulders. Colored shoes. (Taken from a miniature ending of the 9th Century.)

12. *German Nobleman.* 13th Century. Long, girdled robe, mantle fastened with metal tassels. Head-dress of fine linen tied under chin. (Taken from statue in the Dom at Naumburg.)

13. *German Lady of Nobility.* 13th Century. Long, girdled dress—mantle fastened or trimmed with cord and tassels. Cap surrounded by diadem and fastened either on top or at temple with banding brought under chin and pinned to cap.

14. *Titled Young Lady.* (1400). Wide, decolleté, clinging dress with long wide sleeves having scalloped edge.

15. *Titled Young Man.* (1400). Costume—short, tight coat, with long wide sleeves having scalloped edge. Leggings and shoes of different color.

16. *Gentleman of Burgundy.* Costume—brocaded long coat, with padded sleeves (mahoitres). Pointed shoes (aumoniere.) Bag, dagger and belt. (Taken from a miniature in the last half of the 15th Century.)

17. *Gentleman of Burgundy.* Padded sleeves showing at neck the collar of the undergarment. Pointed shoes with extra outer soles. (Taken from a French miniature in the last half of the 15th Century.)

18. *Lady of Burgundy.* Blue underdress over which a trailing robe with border is draped. The robe being low cut at neck, allowing the red breast-band of (cotte) to show. Cornucopia-shaped hat with long veil draped from the back. (Taken from French miniature in last half of the 15th Century.)

19. *Nürnberg Citizen.* (1500). Costume—wide, gold-embroidery bordered velvet mantle.

20. *Nürnberg Woman.* (1500). In house-dress with cap apron and fichu over decolleté dress.

21. *Basel Woman.* (1525). In so-called Gretchen costume carrying on long hanging belt, her scissors, knife, etc.

22. *German Militiaman.* (1550). Costume—slit vest and long wide bloomers.

23. *German Gentleman.* (1575). In Spanish costume—padded short pants with slits showing bright colored padding. Padded vest and tights. Cape with small ruffed collar and small cap (toque) with cord and feather.

24. *Augsburger Patrician.* (1575). German costume under Spanish influence. Bell-shaped stiffened skirt. Small ruff around neck. Cape brocaded plush. Sleeves with small puff at top and apron.

25. *French Lady or Madame.* (1600). In Spanish costume—stiff hoop-skirt drawn tight at waist-line with stiffened frill at

waist. Padded sleeves. Large ruff collar. (Taken from French Miniature.)

26. *German Gentleman.* (1650). A sample of the costume worn by wealthy Germans at the end of the 30-years War. Short vest with wide linen collar. The open sleeves and short vest allow the white skirt to be visible. High boots, the wide tops of which are trimmed with lace. Long hair, or sometimes wig.

27. *German Lady.* (1650). Costume worn at the end of the 30-years War. Short-waisted effect with wide puffed sleeves. Wide costly lace collar. Shoes adorned with rosettes. (Taken from French Miniature.)

28. *Aristocratic Gentleman.* (1700). Costume—tight gold-trimmed over-coat, three-cornered hat with feather trimming. Lace ruff, muff, half-boots with red heels. Blonde wig.

29. *Aristocratic Lady.* (1700). Street-costume. Blue under-garment with silver embroidery and gold fringe. Trailing over-skirt, turned back lace cap. Muff with bow of colored ribbon. Cape with lace decorations.

30-31. *French Fashions of 1760.* Lady in short hoop-skirt with over-garment puffed at waist, on sides and at back. Hair powdered. Gentleman — with small powdered wig.

32. *Marie Antoinette.* Court costume. (1780). Very full hoop-skirt flat in front and back, padded at hips, richly embroidered. High, powdered coiffure, adorned with pearls, flowers and feathers.

33-34. *French Couple.* At time of Directorate. (1795). Lady in latest style showing departure of hoop-skirt and laced waist. Shoes without heels.

35-36. *Lady and Gentleman.* At time of the First Empire. (Taken from Fashion Journal in 1807).

37-38. *Lady and Gentleman.* At time of the "Biedermeier."

39. *Lady in Crinoline.* At time of the Second Empire. (1858). (Taken from Fashion Journal.)

40. *Fashion in 1880.* Tight skirt.

theater is another fine building. There also are many beautiful monuments scattered through the city. The chief pleasure ground is the *Grosser-Garten*, in which are a summer theater and two museum. Near by, is the zoological garden. Dresden is famous for its artistic, literary and scientific collections. The most valuable of these is the picture-gallery, in the museum, which contains 2,500 pictures. This collection is one of the finest in Europe. The so-called Japanese palace contains a library of 300,000 volumes and collections of coins, ancient works of art, china and similar objects. Among the chief branches of industry in the town are manufactures in gold, silver, straw-plait and scientific and musical instruments. Dresden is known to have existed in 1206. It was almost entirely burned in 1491, but was soon rebuilt. In the first half of the 18th century Augustus I and II, Electors of Saxony, by their extensive improvements began to give the city the appearance it now has. The city suffered severely in the Seven Years' War, in the wars of Napoleon and in the Revolution of 1848. It has greatly improved in the last 25 years. Population, 546,882.

Dreyse (*fôn drī'ze*), **Johann Nicholas von,** inventor of the needle-gun, was born in Prussia in 1787. He was a locksmith in his early years, but later worked in a gun-factory in Paris; after which he set up an ironware factory in his native town, where he spent most of his time in making improvements in firearms. In 1836 he completed the needle-gun, which was introduced into the Prussian army in 1840. The next year he opened a gun-factory, which soon supplied weapons for all the German states. He died in 1867.

Drift. Drift or glacial drift is the name given to the deposits made by the ice of the glacial period and by the waters which arose from the melting of the ice. The drift consists of bowlders, cobbles, pebbles, sand and clay, often mingled without trace of arrangement. The bowlders are often two or three feet in diameter, and occasionally 10 or 20 or even 30 feet or more. They are sometimes known as hard heads or, when black, as nigger-heads. They may be composed of any sort of rock over which the ice came. The stones of the drift are often striated. The clay of the drift is really rock-flour, being composed of the comminuted products of rock. The drift deposited by the ice directly is often called till or bowlder-clay. It is not stratified. The drift deposited by the water to which the melting of the ice gave rise is stratified. It consists of gravel, sand or clay.

Drift covers most of the United States north of a line drawn along the south coast of New England, through Long Island, northern New Jersey and Pennsylvania, southern Ohio, Indiana and Illinois and thence along the general course of the Missouri. Drift also covers most of British America, and there are local areas of drift in the western mountains south of the above line. There is a small area of 8,000 or 9,000 square miles, in southwestern Wisconsin and the adjacent corners of Illinois, Iowa and Minnesota, where drift is absent. This area is known as the driftless area.

The sources whence the materials of the drift came are often determinable. Thus, masses of native copper, which could only have come from the Lake Superior region, have been found in Illinois and Indiana. They show that the ice which made the drift of this region moved in a southerly direction. Bowlders from the Palisade ridge above New York are found on Staten Island and on the west end of Long Island, as well as in New York city, showing that the ice here moved to the southeast. The drift is in places as much as 500 feet thick, though its average thickness in the United States is probably not more than half the latter figure.

Drift also covers much of northern and northwestern Europe, reaching south to southern England, the mountains of Germany and to still lower latitudes in the western and central parts of Russia.

For full definition of the drift and its relations see *Journal of Geology*, Vol. II., pp. 708 and 837; and Vol. III., p. 70. For classification of the drift see the same journal, Vol. II., p. 517. See also Dana's *Manual of Geology; Third Annual Report of the United States Geological Survey;* and articles by Chamberlin, *State Geological Reports*, for the drift of the several states. R. D. SALISBURY.

Dromedary. See CAMEL.

Drowning, accidental asphyxia, the remedy for which is the instant resort to artificial respiration and circulation, by supplying fresh air to the lungs and forcing the blood from the engorged right side of the heart. In cases of accidental drowning, where the victims have for some time been submerged, it is well to know what to do to recover them from the sea and how to proceed in the way of resuscitation. In reaching a drowning person, the first precaution on the part of the rescuer is to take care how to approach the victim in the water, after divesting oneself as speedily as possible of all impeding clothing. The general rules to be followed are as follows: In attempts to rescue, if the victim has sunk, the first thing to note is the spot where the body has gone down. If the water be smooth, this will generally be made plain by the air-bubbles which will occasionally rise to the surface, allowance being of course made for the motion of the water if in a tideway or stream, which will carry the bubbles out of the perpendicular course in rising to the surface. If the victim has not sunk but is still struggling on the surface, an assuring hail that help is near should be given; though in ap-

proach to him care should be taken that the one in peril does not seize or otherwise place at a disadvantage his would-be rescuer. It will often be better to hold off until the victim has lost consciousness or even sunk. When the rescuer has got close to the drowning one, or recovered him if he has sunk, take fast hold of the hair of his head, turn him as quickly as possible on his back, at the same time giving him a sharp pull which will cause him to float, then throw yourself on your back also, and either swim for the shore or towards some boat which may put off to the double rescue. Rescues are frequently made by floating idly, until other help comes, and often by paddling with the feet merely, so as to keep the head above water. On rescunig a person by diving to the bottom, the hair of the head should be seized by one hand only, and the other used in conjunction with the feet in raising yourself and the drowning person to the surface. If in the sea, with an outsetting tide, it will be found best to keep both yourself and the drowning one afloat merely, until other help arrives.

Treatment when the body is brought ashore. Summon a physician, then expose the patient to a current of fresh air, wipe dry the mouth and nostrils, rip the clothing so as to expose the chest and waist, and give two or three quick smarting slaps on the stomach and chest with the open hand. If the patient does not revive, try to drain the water from stomach and chest by turning the body face downwards; place a bundle of lightly rolled clothing beneath the stomach, and press heavily over it for half a minute or so long as fluids flow freely from the mouth. Before this, if the jaws are clinched, it will of course be necessary to separate them; to keep the mouth open, force a cork or small piece of wood between the teeth, clearing the mouth and throat of mucus now and then by wrapping a handkerchief round the finger and introducing it into the throat. Especially keep the pit of the stomach, as the patient lies on his face, above the level of any other portion of the body. If other aid be present, let it be utilized by giving an assistant a dry cloth or handkerchief to grip and hold the tip of the patient's tongue, so as to prevent its pulling back and obstructing the wind-pipe; and with the other hand let him grasp both wrists and keep the arms forcibly stretched back above the head, thereby increasing the prominence of the ribs, which tends to enlarge the heart. Meanwhile, actively dry and rub the body, taking care at the same time not to interfere with the means to which resort is had to produce breathing. The limbs should also be well-rubbed, and in an upward direction towards the body, with firm grasping pressure and energy, using preferably the bare hands or dry, warm flannels, which should also cover the body to restore its heat. Bottles of hot water, or heated bricks or stones, should moreover be applied to the limbs and soles of the feet. As soon as breathing is reëstablished, the patient should be stripped of all wet clothing and wrapped in blankets, or put to bed, comfortably warm, but with a free circulation of fresh air. A little brandy and hot water, or other stimulant, should be given the patient every 10 or 15 minutes for the first hour, and as often thereafter as may be deemed expedient; a mustard plaster over the breast is often prescribed, where there is danger of congestion of the lungs; but in most cases it is essential to refrain from effusive fussing and to let the patient rest, especially if watched over by a physician or by an experienced professional nurse.

Dru'ids were the priests of the early Gauls and Britons. How their religion arose or where they got it is unknown. Cæsar has described them more fully than any other writer. They seem to have believed in God and in a future life. Their temples were circles of uncovered stone, open to the heavens. Fire was worshiped, and human beings, especially prisoners and criminals, were often sacrificed. The oak and the mistletoe were held sacred; and whenever mistletoe was found twining round an oak, a festival was held around the tree and a sacrifice was made. The Druids were of three orders — bards, prophets and priests. They had many privileges and possessed much power over the people. They were the teachers of the youth, and seem to have had considerable knowledge on many subjects They settled all disputes between the tribes, and thus were judges also. Their power gradually ceased after the Romans conquered Gaul. For some time after being driven out of Gaul and Britain, their religion lingered in the little island of Anglesea, but was finally driven out by the Romans. Immense stone ruins, supposed to be those of their temples, are still found in Great Britain and in western France. There also were druidesses of different ranks, but little is known of the druids' doctrines. See *Celtic Heathendom* by Professor Rhys.

Drum, a musical instrument supposed to have been brought to Europe by the Moors or soon after the crusades, though the Greeks and Romans seem to have had a kind of kettle-drum. The instrument called a timbrel in the Bible was probably a kind of tambourine, beaten with the fingers. In India a species of drum, called the tomtom, was used in early times, and a like drum existed in Egypt as early as 1600 B. C. Among savages the drum is the chief musical instrument. In the modern orchestra three varieties of drums are used: the ordinary side-drum, the bass-drum and the kettle-drum. The side-drum is a cylinder of thin wood or brass, covered at both ends with parch-

ment, which can be loosened or tightened by strings. It is worn at the side, whence its name; and is beaten on the upper end with sticks. The bass-drum is an instrument of the same kind, but much larger, and is beaten on both ends with sticks having leather-pads. These two drums are used specially in military bands, but also in orchestra. The kettle-drum is a hollow brass or copper basin, covered with parchment and fastened by an iron ring.

Drum'mond, Hon. Sir George, was born in 1829, in Edinburgh, Scotland, and educated at Edinburgh University. He came to Montreal in 1854 to assume the management of a sugar-refinery and in 1879 founded the Canada Sugar-Refining Company. He also founded the Home for Incurables. For many years officially connected with the Bank of Montreal, he now is its president. He was appointed a senator of Canada in 1880.

Drum'mond, Henry, a Scottish author and evangelist, was born at Stirling in 1851. He was educated at Edinburgh University and also at Tübingen, in Germany. In 1877 he became professor of natural science in the Free Church College of Glasgow. He visited America soon after, on a geological expedition to the Rocky Mountains and the Yellowstone Park. He also explored in Africa, in search of unknown animals and insects. In 1877-78 he contributed articles on religious subjects to a magazine. These essays created a wide interest, and with others were made the foundation of *Natural Law in the Spiritual World*, which had the world for its reader. He followed that work with *The Ascent of Man* and with *The Greatest Thing in the World*. He also actively engaged in the religious work that has been carried on in the colleges of England and Scotland, and to him is largely due the change in the whole atmosphere of college-life in all great universities. He died in England, March 11, 1897. See *Life* by Prof. George Adam Smith.

HENRY DRUMMOND

Drum'mond, William Henry, born in Leitrim, Ireland, in 1854. He is professor of medical jurisprudence in Bishops College, and has achieved reputation as a writer of dialect-verse. Some of his poems appear in all standard collections of humorous poetry. The *Wreck of the Julie Plante* and *Johnny Courteau* are well-known.

Drum'mond Light, a very intense white light, produced by allowing an oxyhydrogen flame to play upon a piece of lime. This light is used very largely in projection-lanterns, and for this purpose stands second only to the electric arc. It is now generally called the oxyhydrogen light, although in practice the flame is generally produced by the combustion of coal-gas (not hydrogen) in oxygen. This light was devised in 1825 by Captain Drummond, a Scotch engineer (born 1797, died 1840). The invention was suggested by a remark which he heard in a lecture at the Royal Institution, where the speaker commented upon the brilliancy of incandescent lime. The light was originally intended for illuminating distant stations in the work of the geodetic survey.

Drummondville. A village on the Canadian side of the frontier, overlooking Niagara Falls. Called after General Drummond who was in command of the western army in the War of 1812. Lundy's Lane, a famous thoroughfare is a feature of the village. Nearby was fought one of the most important battles of the war. Now a part of the Canadian city of Niagara Falls.

Drupe, a stone-fruit, as the peach. See FRUIT.

Drupelet, a diminutive drupe, such as are aggregated in a blackberry or raspberry.

Druses (*druz'es*), a people and sect of Syria, remarkable for the success with which they have defended their independence against Turkey. They are distinguished because of their peculiar religion. Their total number is between 50,000 and 100,000, and they are chiefly occupied in producing and manufacturing silk. Their religion is an offshoot from Mohammedanism, though in some points it is much nearer to Christianity. The Druses are noted for their hospitality to strangers, and are very industrious. A bloody war between the Druses and the Maronite sect of Christians took place during the 19th century. It was stopped by the interference of European nations in 1860. See *The Druses of Mount Lebanon* by the Earl of Carnarvon; also *The Land of Gilead* and *Haifa* by Laurence Oliphant.

Dry'ads (*drī'ads*), in Greek mythology, were nymphs or goddesses of trees and woods, each tree or wood being supposed to be the home of its particular dryad.

Dry'den, John, a celebrated English poet, was born in Northamptonshire in 1631. He was educated at Cambridge University. His first work to attract attention was *Heroic Stanzas on the Death of Cromwell*. Soon after he wrote *Astrea Redux*, a poem hailing the restoration of Charles II. He next turned to the writing of plays for the stage; but most of his plays are immoral, and all are the poorest of his works. In 1666 he wrote a poem called *Annus Mirabilis* or *The Wonderful Year*

His most famous poems are satires on other writers or discussions with them. His *Absalom and Achitophel*, published in 1681, has been called the most powerful political and personal satire in English verse. It really is a political pamphlet against prominent men of the time, and full of bitter and biting sarcasm. Another of his best known poems is *Religio Laici*, a theological discussion in rhyme; his *Hind and Panther* is a satirical allegory in defense of the Roman Catholic church, to which he became a convert under James II. *Mac Flecknoe* is another bitter satire, against Shadwell, a literary rival. He died at London, May 1, 1700. See *Dryden* in the English Men of Letters Series; *Lives of the English Poets* by Dr. Johnson; and *Among My Books* by James Russell Lowell.

JOHN DRYDEN

Dry Tortugas, a group of ten islets forming part of Florida, at the end of the Florida keys. They are of coral formation and are low and barren, except where covered with low bushes. On one of them are Fort Jefferson and a lighthouse. During the Civil War the fort was used to imprison Confederate prisoners, and several men concerned in the conspiracy to assassinate Lincoln were confined there.

Dual Alliance. See EUROPEAN WAR p. 160.

Dub'lin, the capital of Ireland, is situated on the River Liffey, at its entrance to Dublin Bay. The river cuts the city into two parts, which are joined by seven stone-bridges and two iron ones, and at its mouth are a good harbor and extensive docks and wharves. The trade is largely in timber, wine, cattle and agricultural produce. The Bank of Ireland, the custom-house, Trinity College, Dublin Castle, Christ Church, and St. Patrick's cathedral are among the finest buildings in the city. The cathedral of St. Patrick was founded in 1190 by John Comyn, archbishop of Dublin. One of the finest monuments in the city is that to Lord Nelson, which is 134 feet high. Those to O'Connell, Grattan and Burke are also noticeable. Trinity College is the most prominent university in Ireland. It was founded in 1591 by Queen Elizabeth, and to-day has a teaching staff of 54 professors, with an attendance of 1,100 students. It has special departments for the study of medicine, theology and engineering, besides the department of arts and sciences. Its library contains 190,000 volumes. The university sends two members to the house of commons. Phœnix Park, which contains about 2,000 acres, has beautiful scenery, and helps to make Dublin one of the most beautiful capitals of Europe. The Danes captured the city in the 9th century Under Henry II the English took possession of the city. It was burned in 1190, and three later conflagrations have destroyed portions of the city. During the protectorate of Richard Cromwell the city was seized by the Royalist party, and in 1861 James II held a parliament there In 1800 the act of union between Great Britain and Ireland was passed, and the flag of the United Kingdom was hoisted on Dublin Castle Population, 309,272.

Dubois, William Edward Burghardt, an American educator of negro blood, was born in Massachusetts in 1868, and attended Fisk, Harvard and Berlin Universities. He is editor of the Atlanta University series of publications, and professor in Atlanta University. Professor Dubois is the author of several books upon the negro question, including *The Negro Artisan* (1903) and *The Relation of the Negro to the Whites in the South* (1901).

Du Bois, (*du-bois'*), **Pa.,** a borough in Clearfield County, about 80 miles from Pittsburg. It is located in a coal-region, but besides its mining-interests it manufactures mining implements, has flour and lumber-mills, an iron-works and extensive car-shops. DuBois has the service of three railroads. Population, 14,000.

Dubuque, Iowa, is a hilly city called "the Heidelberg of America" because of its beauty. It is the county-seat of Dubuque County and is on the west bank of the Mississippi. It is a railroad center and has sash and door factories, railroad shops, cabinet, carriage, machinery, flour and soap works, as well as extensive lumber and pork-packing interests. It is the chief depot for the lead region of northeastern Iowa. There are many fine buildings in the city, and among its educational institutions are a Presbyterian College, a Catholic College, and five Catholic seminaries. At this point three iron bridges span the Mississippi. The city is the oldest permanent settlement in Iowa. In 1893 it was created the see for an archdiocese of the Roman Catholic church. Population, 43,070.

Duccio di Buoninsegna (*dŏŏt'chō dē bŏŏ-ō'nēn-sān'yä*), also known as Duccio di Siena, was born about 1260 and died about 1320. He was the Italian painter who founded the Sienese school. His great picture is the altar-piece of the Madonna in the cathedral at Siena. When completed, the delighted people carried it in a procession to the church.

GROUP OF DUCKS

Spoonbill.
Canvas-back.

Mallard.
Wood Duck.

Pintail.
Hooded Sheldrake.

Du Chaillu (*dū shä'yū'*), **Paul Belloni,** a distinguished traveler, was born at Paris, in 1835. He was educated at a Jesuit institution on Gabun River, in West Africa, where he was for many years a trader. He came to the United States in 1852 and was naturalized, writing about the same time a number of letters on the Gabun country to the New York *Tribune.*

PAUL B. DU CHAILLU

He set out on an exploring expedition to West Africa, in 1855, spending four years, and traveling 8,000 miles on foot, with no companions. On his return he published an account of his expedition, called *Explorations and Adventures in Equatorial Africa,* in which he gave much valuable information about the country and its people. Several years later he made a second expedition to the same region. He wrote several books for young folks, among which are *Gorilla Country, Wild Life under the Equator, Lost in the Jungle, The Country of the Dwarfs, Land of the Midnight Sun* and *Age of the Vikings.* He died on May 1, 1903.

Duck, a large swimming bird, with short legs and webbed feet. The duck-family embraces swans, geese and ducks. The ducks proper are divided into fresh-water ducks, sea-ducks and fishing-ducks. The

MALLARD-DUCK

river-ducks or fresh-water ducks feed in shallow water by tipping. They embrace the mallard, blue-winged and green-winged teals, pintail, wood-duck and others. The common domestic duck is descended from the mallard. The bay or sea-ducks are divers, and descend deep into the water for their food. They are the canvasback, red-head, broad-bill, eider-duck and others. Both these kinds of ducks have bills with roughened margins, that form a sort of strainer. In gathering their food, which consists of small mollusks, crustacea and seeds, they also take in considerable mud. They close the bill and force out the mud through the little spaces along the margins, retaining the food. The merganser or fishing-duck feeds on fish, and stands by itself. Most of the ducks nest in the north, and are hunted during the short period they rest and feed in our waters on their way north and on their return south. The black and the wood-ducks nest in the United States. As game-bird the mallard is unsurpassed, not outrivalled by the famous canvasback. They are almost vegetarians, eat sparingly of fish and other animal food. The haunt of the mallard—also called wild duck, also greenhead—is small lake or sluggish stream where wild rice and rushes grow. Here in August and September they harvest their favorite grain, and here the sportsman tries to harvest them. Ducks fly with great rapidity, are shy and like to fly. The duck lays her eggs, pale-blue or greenish-gray, six or a dozen in number, in a ground nest made of wild hay, leaves, etc. and lined with down from her breast. She very seldom leaves her nest during the 28 days of incubation; when she does, draws the down over the eggs to keep them warm. Many of the young fall prey to the duck-hawk, to water rats and large pike.

Duckbill or **Duck-Male,** a peculiar mammal living in the waters of Australia. These mammals are about 18 inches long, covered with fine fur, and have webbed feet. They have a very broad, horny bill something like the bill of a duck. They burrow from under the water into the bank, and, coming above the water-level, form chambers in which they live. These are often found among the roots of a large tree. They are egg-laying mammals. The eggs are laid in an internal pouch of the mother and hatched there.

Ducking-Stool, an instrument once used for punishing scolding wives. It was made in various ways, often consisting of a chair fastened to the end of a beam, which could be lowered and raised. The woman was fastened securely in the chair, and the beam was then lowered into the water on the see-saw principle. The practice of ducking began in the latter part of the 15th century, and was common in England and America until the early part of the 18th century.

Dudevant. See SAND, GEORGE

Dudley, Robert. See LEICESTER.

Dueling, from a Latin word meaning two men's battle, is a custom which has been common in many countries. The old ordeal by battle was a duel or judicial combat in which, instead of having a case argued in court as now, the two men fought before the judge, the one who was victorious

being thought to have proved that he was in the right. Probably from this custom the modern duel arose. France is the country in which duels have always been most common. It was thought to be the part of a gentleman to resent any insult to his honor, and the most foolish and trivial things were considered insults. Duels were not common till the 16th century, and it is probable that the custom arose from the habit of wearing swords as a part of the ordinary dress, a custom introduced in the 15th century. In England many of the foremost statesmen in the early part of the 19th century fought duels, among them being such men as William Pitt and the Duke of Wellington. The most famous American duel was that between Hamilton and Burr, in which Hamilton was killed. This duel greatly roused the people of the country against the system, and duels became much less common. In Germany the university-students still keep up the practice, and think that a sword-scar across the face is a mark of honor Dueling is also common in the German army, and is not forbidden by law. It was abolished in the English army in 1844 See *History of Dueling* by Dr. Milligen and *Dueling Days in the Army* by William Douglas.

Dufay (*dü-fā'*), **Charles François,** born Sept. 14, 1698; died July 16, 1739. He is distinguished especially as being the man who first discovered that there are two kinds of electricity, which we now call positive and negative His electrical experiments are described in six memoirs published by the French Academy during 1733-4.

Duff, Alexander, a great Scottish missionary to India, was born April 26, 1806, in Perthshire. He was the first missionary sent from the Church of Scotland to India. On the passage he was twice shipwrecked, but reached India in May, 1830 He devised a new plan of missionary work among the natives, giving them instruction in all branches of knowledge as well as religious teaching. The college which he founded was very successful, and after a few years had from 600 to 700 pupils. Ill-health forced him to return to Scotland for a time, but he returned to India later and continued his work. In 1843, owing to changes in the Church of Scotland, Dr. Duff abandoned his college. In 1844 he helped to start the Calcutta *Review*, but had to go home in 1849. Some years later he made a missionary tour through America, which was very successful. Some time after he went to India again, where he was one of the founders and for some time the real head of the University of Calcutta He died at Edinburgh in 1878, leaving his money to found a missionary lectureship. His knowledge of the affairs of India was so great that his opinion was often asked by the English government. Probably no one has done more to arouse missionary enthusiasm than he, and his introducing European education and methods of study among the natives was the beginning of a real advance in the social life of that country. See *Life* by Professor Thomas Smith.

Dufferin, Frederick Temple, Hamilton Blackwood, Marquis of, was born in Florence, Italy, in 1826. His mother was the grand-daughter of Sheridan and noted for her beauty as well as for her gifts as a song-writer. He was educated at Oxford University. Between 1860 and 1872 he held several prominent positions in the English ministry, and in 1877 was appointed governor-general of Canada. In this position he was very successful, the great development of Manitoba during his administration being especially noticeable. In 1879 he was made ambassador to Russia, and later held a similar position at Constantinople. After the rebellion of Arabi Pasha, in Egypt, Lord Dufferin was sent to restore order, and was successful in effecting several reforms in the management of Egypt. In 1884 he became viceroy of India, where his term of office was memorable for the successful arrangements with Russia regarding the frontier of Afghanistan and for the annexation of upper Burma. In 1888 he resigned, and was appointed minister to Rome and created a marquis. His last appointment was as British ambassador to France, retiring finally in 1896. His unfortunate connection as chairman of a corporation for company-promoting in London clouded his later years and did much to hasten his death. He is the author of *Letters from High Latitudes*, descriptive of a yacht voyage to Iceland; *Irish Emigration* and the *Tenure of Land in Ireland; Speeches and Addresses; Speeches in India* (1890) See his *Life* by Sir Alfred Lyall (London, 1905). The Marquis's wife, Lady Dufferin, wrote two delightful books, entitled; *Our Vice-Regal Life in India* (1890) and *My Canadian Journal* (1891), besides the narrative of her philanthropic work in India. *The Record of Three Years' Work* (1889).

MARQUIS OF DUFFERIN

Duffy, Hon. Sir Charles Gavan, statesman and man of letters, was born in Monaghan, Ireland, April 12, 1816, and educated at Belfast Institution. In 1842 he founded *The Nation*, a newspaper, in Dublin, was tried for seditious conspiracy in company

with Charles O'Connell and others the following year, but was released on a writ of error to the house of lords. In 1846 he founded the Irish Confederation, and was repeatedly arrested and tried, though without conviction, for treason-felony. In 1852 he was elected against the chief secretary to parliament. Duffy resigned and went to Australia in 1856. He was minister of public works in the first responsible government of Victoria the year following, prime minister in 1871–2, and was unanimously elected speaker in 1877. He returned to Europe in 1880, and lived in Nice until his death on Feb. 9, 1903. In youth he was a noteworthy poet, and his love for literature showed itself to the end. *The Ballad Poetry of Ireland*, published in 1845, has gone through more than fifty editions. *Young Ireland: A Fragment of Irish History*, brought out in 1880, and *My Life in Two Hemispheres*, brought out in 1898, had much vogue. In addition may be mentioned *Conversations with Carlyle*, *The League of North and South*, *Life of Thomas Davis* and *A Bird's-Eye View of Irish History*.

His eldest son, John Gavan Duffy, born in Dublin on Oct. 15, 1844, and educated at Stonyhurst and Melbourne university, has held many important positions in the government of Victoria, having been minister of lands and agriculture in 1880, postmaster-general in 1890–2 and 1894–9, attorney-general in 1892, etc.

Duhamel (*dü'ä'mĕl'*). The most Reverend Joseph Thomas, Archbishop of Ottawa, was born in the province of Quebec in 1841, educated at St. Joseph's College, Ottawa, and ordained in 1863. Consecrated bishop of Ottawa in 1874, in 1876 he was made archbishop, in 1887 becoming metropolitan of the ecclesiastical province of Ottawa. He is chancellor of the University of Ottawa, and has been earnest and persistent in the cause of education.

Dukhobors. The name signifies Spirit-fighters, and was given to certain Russian peasants because they denied the divinity of the Holy Spirit. Indeed, they also denied that Christ is more than a superior man, who is reincarnated often, appearing in the persons of the founders of this sect and also in many other people at different times. The sect was established as early as 1750, in the province of Kharkov, in south-central Russia. Dukhobors have no church-building, and will not enter churches, saying that wherever two or three are gathered together a religious congregation exists. They have no ceremonies, even at marriages. The Ten Commandments they accept, and whatever else in the Bible seems to them to be useful. They are governed by an assembly of elders, and usually are quiet people, sober and hard-working. They are peasants, all of them. From 1750 to 1793 the sect grew so rapidly that the Russian government began a persecution. In 1800 this policy was changed to one of kindness. Large tracts of fertile lands in central Russia were granted the industrious peasants. In 1819 persecution was renewed, and they were removed to a less favorable district. In 1890 Pobiedonostseff began to apply to them his policy of forcing all Russians into the Greek church. The Dukhobors then begged permission to emigrate. Some were allowed to go to Cyprus; and a large body emigrated to Manitoba, where they still live. Their prosperity in that country continued until 1902, when large numbers of them started in the dead of winter in an aimless march, hoping somehow to find Christ. The Canadian government was finally obliged to drive them home to preserve their lives. In 1903 and again in 1908 the same thing occurred, women and children joining in the march.

Dul'cimer', a musical instrument which looks like a flat box, with wires run across, and tuned by pegs at the sides. It is played by striking the wires with a small piece of wood in each hand or, more usually, with two cork-head hammers. It is one of the most ancient of instruments, and may be regarded as the ancestor of the piano.

Duluth (*du-lōōth'*), a city of Minnesota, the chief lake-port of the state, is situated at the western end of Lake Superior. It has a fine harbor, is the terminus of nine railway-systems, and has an immense shipping trade in grain, flour, lumber, iron and iron-ore. Its grain-elevators have a capacity of 35,000,000 bushels. Its shipments include 10,000 barrels of flour per day, over 30,000,000 tons of iron-ore per year and many hundreds of millions of feet of lumber annually. It is a manufacturing and great wholesale center. Duluth has 38 splendid public-school buildings, with an average attendance of 15,000 pupils. Nearly 1,000 additional pupils are enrolled each year, an indication of the city's rapid growth. Population, 91,913.

Duma, The, was the elective state-council of Russia and (with the Council of the Empire) the legislature of the empire. It originated in consequence of the revolutionary activity of the Russian people during and after the Russo-Japanese War (1904-5). On August 6, 1905, it was created by Emperor Nicholas II, and on October 17 a law was promulgated establishing as an unalterable rule that no law shall take effect without the *Duma's* approval and that to those whom the people elect shall be guaranteed real participation in controlling the legality of the acts of such authorities as the emperor appoints. It consisted of members elected for five years and representing the 97 provinces and the 28 largest cities. The election of the depu-

ties is indirect, being made by electoral bodies themselves chosen by elective assemblies. On March 6, 1906, changes were made in the constitution of the *Duma*. It received equal legislative powers with the Council of the Empire and the same right of initiative in legislation and of putting questions to ministers. Every measure before being submitted to the emperor was required to be passed by the *Duma* as well as the Council. Any measure rejected by the *Duma* or by the Council was not even laid before the tsar. The *Duma*, like the Council, had the right to annul the election of any member. The sittings of both bodies were public. Debates might be ended by decision of the majority. The *Duma* was not empowered to receive petitions or deputations. Ministers of the government might be elected to the *Duma* and vote as members. The legislators were paid about $5 a day during sessions, received their traveling expenses, had personal immunity during sessions, and were liable to arrest only with the *Dumas's* permission. Bills rejected by the tsar could not again be brought forward during the same session, nor those rejected by it be brought forward again at all without the tsar's consent.

Dumas (*dü'mȧ'*), **Alexandre**, a celebrated French writer, was born in 1802. He was brought up in a country-town, and when about 21 went to Paris to seek his fortune. He began to write plays, and soon his *Henry III* gained him a great reputation in Paris. Soon after, he visited Switzerland and wrote for a magazine his impressions of the journey. This work was also successful; but it was his *Monte Cristo* which made his reputation world-wide. This was soon followed by his no less famous *Three Musketeers*. After these works he undertook to write a large number of stories, any one of which was enough to keep an ordinary man busy. In order to do this work, he hired several young writers, and when they had written the first draft of a story, Dumas worked it over and had it published under his own name. This brought him into disrepute, but he kept on in the same plan. He was extravagant in every way, and after engaging in several wild schemes, one of which was joining Garabaldi in 1860, he lost all his fortune and died penniless in 1870.

ALEXANDRE DUMAS

Dumas, Alexandre (known as Dumas the younger), French novelist and dramatist, was born at Paris, July 28, 1824, and died there on Nov. 27, 1895. He was the son of A. Dumas *père*, author of *Monte Cristo*, and was educated at the *Collège Bourbon*, in Paris. He began his literary career by publishing, at the age of 17, a volume of poems, *Péchés de Jeunesse*, after which he accompanied his father on a tour in Spain and in northern Africa. He created a sensation by the issue of *La Dame aux Camélias*, after which, for nearly 40 years, appeared a stream of novels and writings for the stage, which deal largely with the *demimonde* of Paris. His brighter plays include *Le Fils Naturel*, *L'Ami des Femmes*, *Dénise* and *L'Affaire Clémenceau*. He became a member of the French Academy in 1875 and a grand officer of the Legion of Honor in 1894.

ALEXANDRE DUMAS (*fils*)

Du Maurier (*dü mō'ryȧ'*), **George L. P. B.**, a naturalized British artist, notable for his sketches in London *Punch*, was born at Paris, March 6, 1834, and died at London, Oct. 8, 1896. Settling early in London, after studying art in Paris, he began to contribute sketches to *Once a Week*, to *Cornhill Magazine* and to *Punch*, subsequently joining the staff of the latter, the pages of which he enriched with caricature sketches of society-life as typified in London high life. He also illustrated Thackeray's *Esmond* and *Ballads*, and in 1891 appeared as a novelist and lecturer. His novels, which were illustrated by his brush, include *Peter Ibbetson*, *Trilby* and *The Martian*.

GEORGE DU MAURIER

Dumouriez (*dümōō-ryȧ'*), **Charles François**, a general during the French Revolution, was born in 1739. When the revolution broke out, he joined the popular party, and in 1790 was appointed commander at Nantes. He was then named minister of foreign affairs, but resigned the position to take command of one of the French armies; and it was largely by his strategy that France was victorious over the allies at that time. He gained the battle at Volney, and over-

threw the Austrians at the great victory of Jemappes, but was defeated by the Austrians in 1793. The revolutionists at Paris did not trust his loyalty to their cause, but denounced him as a traitor and summoned him to Paris. In order to save his life, he gave himself up to the Austrian general. He finally settled in England as an exile, and died in 1823. See *Life and Memoirs.*

Düna. See DWINA.

Dunbar, Paul Laurence (1872-1906), an American poet of African blood, was born at Dayton, O., in the high-school of which city he was educated. His volumes of verse, which are partly in dialect, received high commendation from critics and litterateurs. They include *Oak and Ivy* (1893), *Lyrics of Lowly Life* (1896), *Poems of Cabin and Field* (1899) and *Lyrics of the Hearthside* (1899). Besides these, Mr. Dunbar issued a volume of short stories, *Folks from Dixie*, and two novels, *The Uncalled* (1898) and *The Sport of the Gods* (1902). The poet-novelist also lectured, and in 1897 was appointed to a position in the Library of Congress; but subsequently he fell into ill-health and died at Dayton, Ohio, of consumption.

Dundee, the third city in size in Scotland, is situated on the River Tay, ten miles from its entrance to the sea. Among its fine buildings are the town-hall, with a spire 140 feet high, built in 1734; the Albert institute and Free library, the Royal exchange and several churches. Dundee is the chief seat in Great Britain of the manufacture of coarse linen fabrics. Manufactures of coarse cloth from jute, such as bagging and carpets, are also carried on, on a large scale. Dundee is also famous for its confectionery, which is sent all over the world. The city has a fine harbor and excellent docks. Dundee returns two members to Parliament. It has an interesting history that inspired *Up with the Bonnets of Bonnie Dundee!* Population 169,409.

Dunedin, seaport and capital of Otago, situated on Otago harbor, in South Island, New Zealand. It was founded in 1848 by settlers chiefly from Scotland, and received an impetus in 1861 by the discovery of gold in its neighborhood. The city has many handsome buildings and is lighted by electricity, and it has tramways and other civic improvements. Wool is a large export. Dunedin is the seat of Otago University, one of the four affiliated colleges of New Zealand. Population, with suburbs, 64,237.

Dunes. Where the land is gaining on the sea, either at the bars or mouths of rivers or along the seashore, the land deposited is of fine sand. This the wind, in time, often heaps into ridges, sometimes of considerable height, but more often 10 to 30 feet. Such ridges, which usually are bleak and waste, are dunes. They are found along the western shore of France, along the eastern coast of the United States and in many other places. They may be dangerous to man, first because he is sometimes tempted to build on them, though a great storm may sweep them away; and second because the sand-hills are sometimes carried inland by the wind. In France villages have slowly been covered and destroyed by advancing dunes.

Dunkards (from the word meaning "to dip"), Dunkers, or German Baptist Brethren, are a large sect of Baptists which was first organized in 1708 in Westphalia. Alexander Mack was chosen as its first minister. The sect is a strict one, and in some respects like that of the Quakers. The Dunkards live and dress plainly, and hold it wrong to fight or take an oath. The sect emigrated to America early in the 18th century, and by 1730 was established in Pennsylvania. An offshoot of the Brethren, known as the Seventh-Day Dunkards, keeps the seventh instead of the first day as the Sabbath. But the greater part of the sect, though they were driven from Germany by persecution, do not hold different beliefs from other Protestant churches. They, indeed, have a monastery, but those who enter it are not forbidden to marry. Their religious paper, *The Gospel Messenger*, has a wide circulation. Even in the 18th century the Dunkards expressed themselves against slavery and, above all, against the slave-trade. Since 1883 there has been a division among the Brethren; those of the Old Order clinging to older forms of dress and opposing higher education, while the Progressives see the need of outward changes and are content to preserve the spirit of their faith.

Dun'kirk or **Dunkerque,** the northernmost seaport of France, is on the Strait of Dover. It is a very strong place, both from its fortifications and from the ease with which the whole surrounding country can be submerged by water. The harbor is large, and the city carries on shipbuilding extensively It has manufactures of linen, leather, cotton, soap, etc., and has a large trade by sea The town was burned by the English in 1388, and was captured by them under Cromwell in 1658, but was sold to Louis XIV by Charles II a few years later. By the treaty of Utrecht the French were compelled to destroy the fortifications, but they were rebuilt in 1783. The Duke of York sought to capture it in 1793, but was defeated with great loss. Population, 38,891.

Dunkirk, N. Y., a city and port of entry on the southern shore of Lake Erie, is the second largest city in Chautauqua County. It has a fine harbor and is on the lines of four transcontinental railroads. A number of mills, factories and industries, and extensive locomotive works are located there. Over 8,000 carloads of grapes are annually shipped from Dunkirk. It is well situated for trade with

its excellent harbor and railway facilities. Population, 20,000.

Dunmore, Pa., a town in Lackawanna County, northeastern Pennsylvania, in the rich anthracite-coal region of the Lackawanna valley. It is situated two miles north of Scranton, the Erie and Wyoming Valley Railroad traversing it. Its trade is chiefly in coal. Population, 17,615.

Dunne, Finley Peter (1867–), American journalist and humorist, popularly known as Mr. Dooley, was born in Chicago, Ill. After obtaining a common-school education he began his career as a reporter, subsequently rising to the post of city-editor, a member of the editorial staffs of the *Times*, *Times-Herald* and *Evening Post*, and finally editor-in-chief of the *Evening Journal*. His Mr. Dooley sketches, which have made the writer widely known, first appeared in the Chicago *Times-Herald*, the prototype of the humorous commentator on political and social themes being a Chicago saloon-keeper who died in 1901. The Spanish-American War gave Mr. Dunne a notable theme for the exercise of his peculiar philosophy mixed with satire; while he widened his audiences by his publications, which include *Mr. Dooley in Peace and in War; Mr. Dooley in the Hearts of his Countrymen* (1898), *Mr. Dooley's Philosophy* (1900), his *Opinions* (1901); his *Observations* (1902); and *Dissertations*, all embodying shrewd criticisms and alternately wise and amusing talks. Mr. Dunne now resides in New York City.

Dun'stan, St., archbishop of Canterbury, was born in Glastonbury in 924 A. D. He was educated at the abbey of Glastonbury and became a monk there, giving himself up to study and music. Dunstan soon after went to the king's court and was appointed abbot of Glastonbury. His abbey soon grew to be a famous school, but Dunstan did not give all his time to it; he became the chief adviser of King Edmund. When the young Edwy became king, Dunstan lost favor, but was soon called back by Edgar, who had become king of the country north of the Thames. After Edwy's death Edgar became king of the whole country and Dunstan was made archbishop of Canterbury. The wise measures which made Edgar's reign one of the most peaceful and prosperous in early English history were largely due to Dunstan. It was his policy to join the Danes and English in England into a single kingdom. He died at Canterbury in 988. See *Memorials of St. Dunstan*, by Bishop Stubbs.

Dupleix (*dü'plā'*), **Joseph Francois, Marquis,** a celebrated governor of the French East Indies, was born in 1697. His father was a shareholder in the French East India company, and had his son appointed to a position in India, and ten years later he became superintendent of Chandernagore in Bengal. He was so successful that he was soon appointed governor-general of Pondicherry, including all the French Indies, and there he was so skillful in managing the native chiefs that the Carnatic soon became almost a French province. When war broke out between England and France, Dupleix was for a time successful against the English; but his plans were finally frustrated by Lord Clive. In 1754 England and France came to an agreement regarding India, and Dupleix was recalled to France, where he died in 1764. Had the plans of Dupleix succeeded, it is probable that India would now be under French instead of English control. See *French in India*, by Malleson, and *Struggle between England and France for Supremacy in India*, by Rapson.

Dupont (*dū-pŏnt'*), **Samuel Francis,** an American rear-admiral, was born at Bergen Point, N. J., in 1803. In the summer of 1861 he was given command of the Atlantic blockading squadron. He also commanded the expedition which captured Port Royal harbor, in the same year. He was made rear-admiral in 1862, and the next year commanded the fleet of ironclads which attacked Sumter, where he was defeated. In 1863 he resigned his command, and died at Philadelphia in 1865.

Duquesne (*du'kân'*), **Pa.,** a borough in Allegheny County, about ten miles from Pittsburg. It is located on the Monongahela River, and is served by the Pennsylvania Railroad. It is engaged in manufacturing steel and iron-products. Population, 15,727.

Durand (*dū-rănd'*), **Asher Brown,** a well known American artist, was born at Jefferson, N. J., in 1796. He engraved many excellent portraits, but gained his greatest fame as a landscape painter. The *Capture of Major André* and *A Primeval Forest* are among his best paintings. He died at South Orange, N. J., Sept. 17, 1886.

Duration in Plants. The variation in duration among plants is extreme. Some of the simplest of plants may endure but a few days or even less, while certain trees are known to endure for several centuries. Among seed-plants an attempt has been made to classify duration roughly under three heads, namely, annual, biennial and perennial plants. The annual plant lasts but a single growing season, but even within that limit there are great differences in actual duration. Often, also, confusion arises from the fact that the parts above ground may be annual while those beneath the surface may endure for a much longer time. There are annual stems which are put up year after year by perennial roots or underground stems. A true annual is a plant which disappears completely at the end of the season, and continues over to the next only in the form of a seed. The name biennial has been given to those plants

which form foliage one season, put up a flower-stalk the next, and then disappear. The radish, turnip and the like are good illustrations; but under cultivation they have been made to go through their whole life-history in one season. Perennial plants are those which endure season after season, and of course differ widely from one another in the number of years involved in their duration. In general, annual and biennial plants belong to the same category, for they are comparatively transient forms. The perennial plant is the one which really endures, whether in the form of underground parts or in aerial parts which endure, as in shrubs and trees. The ephemeral habit, which consists of the disappearance of plants in one or two years, to be carried over to a subsequent growing-season by seeds, is a habit which has resulted in protection against an unfavorable season. In any region, therefore, where a season of cold or of drouth comes regularly, many plants have developed as annuals and biennials, or, in other words, have developed the ephemeral habit. The perennial habit involves an unusual development of protective structures, which the ephemeral habit avoids.

Dur'ban, the seaport and, with Pietermaritzburg, the chief town, of Natal, South Africa. It is situated on a landlocked tidal bay, accessible for all vessels; a railroad runs inland from it throughout the colony. The town was laid out by a colony of Dutch burghers in 1842, and derives its name from Sir Benjamin D'Urban, once governor of the Cape. Pietermaritzburg, the capital (population 31,199), lies about 60 miles northwestward. Durban is one of the trade-gates of South Africa, and figured prominently as the landing-place of the British forces in Natal operating against the Boers. A large population of the town are Kafirs. The number of its inhabitants is 59,000.

Dürer (*dü'rĕr*), **Albrecht,** the most celebrated artist of Germany, was born at Nuremberg in 1471. He was apprenticed to a painter in his native town, and, some years later, after a period of travel, married and settled as a painter at Nuremberg. He soon after began designing on wood and engraving on copper, and many of these pieces still exist. In 1505 he proceeded to Venice, and after his return painted his *Adam and Eve*, which is now at Florence, and his *Assumption of the Virgin*, one of his finest works, but part of which has since been burned. He was much employed by Emperor Maxmilian I. In 1520 he went to the Netherlands and painted the portrait of Erasmus, and while there he was appointed court-painter by Charles V. He died at Nuremberg in 1528. Besides being the greatest of German artists, Dürer ranks even higher as an engraver on metal and as a designer of woodcuts. The most celebrated of his copperplates are the *Little Passion* and *St. Jerome in His Study;* and of his woodcuts, *The Greater Passion*, *The Little Passion* and the *Apocalypse* are the best known. See *Albert Dürer*, by Thausing, English translation by F. A. Eaton.

Durham, John George Lambton, First Earl of, was born at London, April 12, 1792, was in the house of commons from 1813 to 1828, and lord of the privy seal in 1830. He aided in preparing the first reform-bill, was successively ambassador to Russia, Austria and Prussia, and was appointed high commissioner for the settlement of the troubles of Canada and governor-general of the British provinces in North America on March 31, 1838. He immediately set himself to ascertaining the causes of the widespread troubles. To each province he sent a commission of inquiry, and called into conference the governors of Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island. It was then that the future confederation of the Canadian Dominion had its first great impetus. A scheme of union between Upper and Lower Canada was also worked out, and a masterly report on the condition of affairs prepared and presented to Parliament. The adverse criticism caused by his proclamations of amnesty led to his sudden resignation. He died at Cowes, on the Isle of Wight, July 28, 1840.

Durham (*dŭr'am*), an ancient English city, near the center of Durham County, is built around a steep rocky hill, which is nearly encircled by the River Wear. On the top of the hill, which is partly inclosed by old walls, are the castle and cathedral. Durham arose about 995, when a church was built to enshrine the bones of St. Cuthbert. In 1093, on the site of this old church, was commenced the present cathedral, one of the finest specimens of Norman architecture in Great Britain. The castle, once the residence of the bishops of Durham but now occupied by Durham University, was founded in 1072 by William the Conqueror, but has been much changed since. The dormitory of the monastery of Durham, now the university library, is one of the finest in England. The bishopric of Durham extends over the entire county, and has had many celebrated men as bishops. The present university, which has a small attendance, was opened in 1833.

Duse, Eleonora (1859–), an Italian actress of note, was born at Vigevans, on the border of Piedmont and Lombardy, and first appeared on the stage when but 13. She early became a favorite with Italian playgoers, playing in Florence, Naples and Milan. Later on she appeared at Vienna, Berlin, Paris and London, achieving triumphs in various rôles, such as Juliet,

Marguerite, Magda, Camille, Francesca da Rimini, Paula in *The Second Mrs. Tanqueray*, Santuzza in *La Cavalleria Rusticana*, etc., etc. In 1893 she appeared at New York as Camille. She revisited this country nine years later, where her talent and, especially, her great dramatic power were enthusiastically recognized and praised. In the Old World her triumphs have also been many and especially her acting of Mirandolina in Goldoni's *La Locandiera* and in the heroines of Gabriele d' Annunzio's *Gioconda* and his *Francesca da Rimini*.

Düsseldorf (*düs'sel-dôrf*), the chief town in the district of the same name in Rhenish Prussia, is situated on the right bank of the Rhine, at the mouth of the Düssel. The streets are large and regular and planted with trees, while the large number of squares and tasteful parks greatly helps the appearance of the city. Of late years the trade and industries of Düsseldorf have largely increased, the iron and cotton-industries being important, as are also manufactures of pianos, paper, soap and beer. The city is specially noted as a center of art. The Düsseldorf Academy, under the management of well-known artists, was celebrated during the first half of the 19th century. The art-hall contains a gallery of modern etchings. The famous picture-gallery, founded in 1590, was in part removed to Munich in 1805. Several of the churches are old and full of interest, and the city has one of the finest public gardens in Germany. Population, 357,702.

Dutch East India Company. This company was formed in 1602 by the union of several smaller companies to secure a monopoly of the Dutch trade to the East Indies. During the long war with Spain and Portugal the Dutch Company managed to deprive Portugal of all its possessions in the East Indies. The company established a valuable colony at the Cape of Good Hope; and took Ceylon from Portugal in 1658. In spite of English and French competition the Dutch Company was very successful, especially during the seventeenth century, when its dividends ranged from 12 to 63 *per cent.* But the proclamation of the Batavian Republic under French control in 1795 put an end to the existence of the company, which had during the 18th century at times required state-support. The English had already driven the Dutch Company from India and crippled its trade. But in 1815 many of the possessions of the Dutch East India Company were restored to Holland.

Dutch Republic, The, was founded by the union of the seven northern provinces of the Netherlands, during the long and heroic war against Spain for freedom of religion and government. These provinces, Holland, Zeeland, Utrecht, Gelderland, Groningen, Overyssel and Friesland, formed their union in 1579 and declared their independence in 1581. The war of liberation became a fierce crusade. The Netherlands had been a province of the German Empire under Charles V; but under Philip II they were no more than a province of Spain, and the rooted idea of Philip was to stamp out heresy from his dominions. In 1567 he sent the Duke of Alva with a Spanish army to the Netherlands; and among the victims of the persecution that followed were Counts Egmont and Hoorn. But in 1586 the Prince of Orange entered the field with a small army; and so began the forty years' struggle for freedom. At times the Dutch were helped by France, at times by England; but it was the great courage and faith of the people that in the end won their liberty. In 1581 William of Orange was made ruler of Holland and Zeeland; but in 1583 he was murdered at Delft. Maurice of Nassau, the son of William of Orange, at length won a decisive battle in 1600 at Nieuport. Meantime the Dutch fleets had seized the Portuguese and Spanish settlements in the East Indies. A 12 years' truce in 1609 practically granted the independence of the Dutch Republic, which entered upon a period of prosperous trade and of naval and commercial rivalry witn England. The Dutch East India Company was founded in 1602; and the Dutch West India Company, which controlled New Netherlands (New York) in 1621.

After the 12 years' truce with Spain expired, war was renewed, but was ended in 1648 by the Peace of Westphalia. The greatest days of Holland were those of its naval successes against England in the wars of 1652 and 1665; but the English fleets in the end proved too strong. In 1688 the stadtholder of Holland was called to the throne of England as William III. Holland now became one of the foes of Louis XIV. Peace was only restored in 1713 by the Peace of Utrecht. Holland then began to be ousted by England from her trade. In 1780 she had a short war with England; and in 1782 was the second power to recognize the independence of the United States. Hitherto the Dutch Republic had been rather aristocratic; but in 1795 the French compelled Holland to accept a new republican constitution as the Batavian Republic. In 1806 Napoleon changed this form of government into the Kingdom of Holland under his brother Louis. In 1810 the country was annexed to France. But in 1813 the French were expelled and the House of Orange restored; and in 1815 Holland and Belgium were united. This was the end of the Dutch Republic. Belgium was made an independent kingdom in 1830.

Duties. See TARIFF.

Dvina. See DWINA.

Dvorak (*dvôr zhäk*), **Antonin,** Bohemian composer, was born at Mühlhausen on the Moldau in 1841, and was the son of an inn - keeper. He learned music, it is said, first from the gypsies, but entered the Prague conservatory as bandsman and organist. In 1883 his famous *Stabat Mater*, produced in London in that year, first stamped him as a really great composer, and earned for him later the honorary degree from Cambridge of Doctor of Music. His *Spectre's Bride*, composed for the Birmingham festival of 1885, met with enthusiastic reception, as did his oratorio, *St. Ludmila*, composed for the Leeds festival (1886). In 1892 he wrote a four-act opera, *Dimitrij*, which was first produced in Vienna. In the same year he visited the United States, where he took the direction, for a while, of the National Conservatory of Music at New York, and while there wrote a cantata, entitled *Columbus*, which was produced at the Metropolitan Opera House, New York. His other works include dances, songs and symphonies, an opera, *Jacobin*, and a cantata, *The American Flag*. A further popular work of Dvorak's is *Der König und der Köhler* (The King and the Charcoal-Burner). He died in 1904.

ANTONIN DVORAK

Dwarf, name used especially for people much under the average size of mankind. The ancients believed there were races of dwarfs, and Aristotle declared that eye-witnesses affirmed that many of these little people lived in caves on the banks of the Nile. The most notable dwarf-races of men are the Bushmen, who are about four feet seven inches in height; the Akkas in Central Africa, about four feet ten inches high, by whom Stanley was much troubled in 1881; the Obongos on Gabun River; and the still smaller Batwas, about four feet three inches high. Other tribes of small stature are also reported. In the myths of the old Germanic nations dwarfs play a prominent part. They had their kings and lived in caves within the earth, where they kept treasure and works of art. Dwarfs used to be often kept as court-pets, and lately it has become common to exhibit them as curiosities in shows. The most famous of American dwarfs was Charles Stratton, called General Tom Thumb. When he married Miss Lavinia Warren, in 1803 he was 31 inches in height, his wife being one inch taller. With their child and another dwarf, called Commodore Nutt, they were exhibited through America and England. Flynn of New York, called General Mite, was only 21 inches high. Dwarfs are oftentimes strong for their size and quite intelligent. See *Giants and Dwarfs*, by E. J. Wood.

Dwight, Timothy, a well-known American theologian and educator, was born in 1752, at Northampton, Mass., and was a grandson of Jonathan Edwards. He studied at Yale College, was a chaplain in the American army during the Revolution, and settled as a minister at Greenfield Hill, Conn., where he also conducted an academy with great success. In 1795 he became president of Yale College. He died at New Haven, Conn., in 1817. His sermons on theology had a wide influence. See *Life of Timothy Dwight*, by W. B. Sprague, in Sparks' *American Biography*.

TIMOTHY DWIGHT

Dwight, Timothy, grandson of the preceding, was born at Norwich, Conn., in 1828, and elected president of Yale University in 1886. He was a member of the American committee for the revision of the English version of the Bible. He published in 1872 *The True Ideal of an American University*.

Dwina (*dwē'nä*), **Dvina** or **Düna,** the name of two important rivers of Russia. (1) The northern Dwina is formed by the coming together of the Sukhona and the Yuk. It flows in a general northwest direction through a flat country to the Gulf of Archangel. Its length is about 450 miles, and it has several large tributaries, the largest of which, the Viuchegda, is navigable for 500 miles. The river is a valuable channel of inland trade. (2) The western Dwina rises not far from the source of the Volga and the Dnieper, emptying into the Gulf of Riga. Its course is 500 miles long, part of which is navigable. It is connected with the Dnieper, and thus with the Black Sea, by the Beresina Canal, and by other systems with the Caspian Sea, the Neva and the Gulf of Finland.

Dyaks. See BORNEO.

Dyment, Albert E., born at Lynden, County of Wentworth, Ontario, 1869. His father English, his mother Scotch, Educated at Barrie Collegiate Institute and at Upper Canada College. A prosperous manufacturer and dealer in lumber. Elected for Algoma to the House of Commons in 1896 and in 1900 and for

Algoma East in 1904. Is Honorary Lieutenant-Colonel of the 97th Regiment in 1907. A Liberal.

Dynam'ics is that science whose aim it is to describe most completely and most simply the motions which occur in nature. This is the definition given by Kirchhoff. But his illustrious colleague, Helmholtz, defines dynamics as the science of those phenomena in nature which may be reduced to the motion of ponderable masses. The difference between the two definitions is slight; and it vanishes completely if we assume that *all* the phenomena of nature can be explained, ultimately, in terms of matter in motion.

Perhaps the simplest method of getting a clear idea of the object and the method of dynamics is to consider the orderly sequence of steps by which this science, in its modern form, has been built up.

KINEMATICS

1. Before the motion of a particle can be described, we must be able to define the position of that particle: for motion is merely change of position. For this purpose dynamics makes use of the ordinary geometry of position. As is well known to everyone, when we wish to locate a point on the earth's surface, we must tell three things about it, namely, its latitude, its longitude and its height above the sea-level. So in dynamics it requires always three specifications (called co-ordinates) to locate a particle. Knowing how to locate points, one can then easily locate any rigid body. For if any three points (not in the same straight line) in such a body are fixed, the entire body itself is fixed.

2. The second step in dynamics is to describe the change of position or displacement in bodies. But since change of position is the same kind of quantity as position itself, we still use simply the geometry of position for this purpose.

3. The third step is to describe the rate of change of position This introduces a new quantity, time. To measure time we use a body in uniform motion, that is, we use a body which is set in motion and let alone. The most uniform motion that we know anything about is the rotation of the earth on its axis. Accordingly the average period of rotation of the earth with respect to the sun is called a day. And 1-864,00th part of a day is called a second. This is the unit of time most frequently employed in dynamics. The idea of time being clear, the rate of motion or the velocity of a particle is defined as "the ratio of the change of position to the time occupied in this change" The numerical value of any velocity, without reference to its direction, is called its speed.

4. But since practically all velocities in nature are changing, the fourth step in dynamics is to define the rate of change of velocity. This is called acceleration, and is measured by the ratio of the change in velocity to the time occupied in the change.

Up to this point we have considered merely the motion of a body, but have not asked any questions concerning the causes of these motions. This science of motion alone is called kinematics, which is merely a Greek word for science of motion. Kinematics may be taken as a purely mathematical subject; but, as a matter of fact, it nearly always forms the first chapter of any treatise on dynamics

DYNAMICS

5. Passing now to the thing in motion—that which we call matter—we find that the quantity of it can be measured just as it was in the case of time and space, but we cannot define it, any more than we could time or space. Time may be called duration and space may be called extension but no one is any the wiser for all that. So the amount of matter in a body is called its mass; but this is not a definition of matter; it is merely a convenient name for the amount of substance in any body. The measure which is employed for matter is its *inertia*, that is, its tendency to remain at rest if it is at rest or to remain in motion if it be in motion. If one body is twice as hard to set in motion as another, it is said to have twice the inertia of the other, that is, twice the mass of the other. It was shown by Newton that all bodies, regardless of their chemical composition, are attracted by the earth with forces which are strictly proportional to their masses. And hence we use the balance when we wish to compare (*i. e.*, to measure) two masses.

These three ideas, mass, space and time, are the fundamental concepts of dynamics. Proceeding from these, Galileo, Huygens, Newton and Lavoisier constructed what might be called the first modern system of dynamics. The experimental facts which lie at the foundation of this system are Newton's laws of motion and Lavoisier's discovery of the conservation of matter.

NEWTON'S LAWS OF MOTION

Before these experimental facts can be stated in a clear and definite manner, it is essential to introduce two more fundamental quantities, viz., the linear momentum of any body, which is defined as the product of its mass by its velocity, and the force acting upon any body, which is defined as the product of its mass by its acceleration; or, what amounts to the same thing, the time-rate at which the linear momentum is changed. Newton's laws may now be stated as follows:

I. If a body is in translation under no external force, its linear momentum remains constant.

II. The change in the linear momentum of a body is proportional to the force acting upon the body; and the direction of the change is the same as the direction of the force.

III. Action is always equal and opposite to reaction; by which is meant that the mutual forces of any two bodies or of any two parts of a body are always equal and oppositely directed.

Lavoisier showed that the amount of matter in any isolated system cannot be increased or diminished by any known means: and therefore presumably, that "the amount of matter in the universe is a constant."

6. The next great step in dynamics is the introduction of the idea of work and energy. Work, in dynamics, is employed to denote one definite quantity, viz.: the product of a force multiplied by the distance through which it is exerted, both distance and force being measured in the same direction; while energy is defined simply as the ability to do work, and is, therefore, measured in the same units as work.

By 1847 Helmholtz, together with a number of his contemporaries, had proved that though the energy which a system of bodies possesses may assume a great variety of forms, yet the amount of that energy is a constant quantity. The energy of the universe is continually undergoing transformation; but there is no evidence for thinking that the slightest bit of energy has ever been annihiliated or created by man. This summary is known as the principle of the conservation of energy. Nearly all the problems of dynamics are solved by applying to the particular case in question either Newton's laws of motion or the law of the conservation of energy.

DYNAMICS OF ROTATION

7. A very great simplification in the treatment of dynamical problems is secured by the fact that all cases in rotation may be solved not only by the same principles, but by the same formulæ, as in the case of translation.

We have only to replace linear displacement, x, by angular displacement, θ; and linear inertia, m, by rotational inertia, I. The following table gives a summary of the principal quantities involved in translation and rotation, and shows that they are identical in form in the two cases:

TRANSLATION		ROTATION	
Inertia (=Mass)	m	Rotational inertia {moment = of inertia}	I
Linear Displacement {change = of position}	x	Angular Displacement	θ
Time	t	Time	t
Linear Velocity	$v=\frac{x}{t}$	Angular Velocity	$\omega=\frac{\theta}{t}$
Linear Acceleration	$a=\frac{v}{t}$	Angular Acceleration	$\gamma=\frac{\omega}{t}$
Linear Momentum	$M=mv$	Angular Momentum	$G=I\omega$
Force	$F=ma$	Moment of Force	$L=I\gamma$
Energy of Translation	$E=\frac{1}{2}mv^2$	Energy of Rotation	$E=\frac{1}{2}I\omega^2$

8. Up to this point we have no principle which will determine the direction in which any dynamical process occurs. The law of the conservation of energy would be equally well-satisfied whether a clock-weight ran down and delivered energy to the clock-train and the air, or whether the clock-weight ran up, deriving the necessary energy from the heat in the train and in the air. It has been found convenient to divide all kinds of energy into two groups—energy of position and energy of motion—called potential and kinetic energy respectively. And it has been discovered by Clausius, Kelvin, Helmholtz and others that, in general, "the potential energy of any system tends to become a minimum." Armed with this theorem, which is, perhaps, the most general principle of dynamics, we are prepared for the solution of all the ordinary problems of mechanics. The method in general consists in writing, in the form of equations, the six conditions of equilibrium, namely, that all the forces shall be zero and that all the moments of force shall be zero, and then solving for the quantity desired.

Upon the eight general principles enunciated above are constructed the entire

superstructures of astronomy, physics and mechanical engineering.

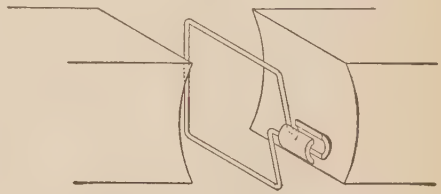
For the history of the subject see Mach's *Science of Mechanics*, translated by McCormack; for the laws of motion see Tait's *Newton's Laws of Motion;* for a treatment of rotation see Worthington's *Dynamics of Rotation.*

Dynamite, from a Greek word meaning strength, is produced by mixing nitroglycerine with a kind of earth, known under its German name of *keiselguhr.* Nitroglycerine was discovered in 1846, but it was not till 20 years after that the experiments of Alfred Nobel, who combined it with the earth just mentioned, made it of practical importance. Dynamite has a reddish-brown color, and is about one part earth to three parts nitro-glycerine. It burns with a yellowish flame and, in small quantities, without danger. The time of an explosion of a dynamite-cartridge is about the 24,000th part of a second. Dynamite is much used for breaking up bowlders, and is used under water as well as on land, the water causing the loss of only six *per cent.* of its power. For quarrying purposes gunpowder is generally used, as dynamite breaks up rock too much. Dynamite is also used in explosive shells that may be fired from guns of special construction, a dynamite gun having been invented in 1883. Unfortunately, it has been also employed for the destruction of life and property.

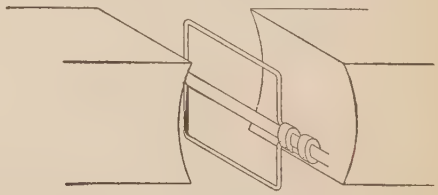
Dynamo. See ELECTRICITY.

Dynamo-Electric Machine or, simply, dynamo, a machine for generating an electric current in a conductor by moving the conductor in the magnetic field of a magnet or system of magnets. The motion is relative, that is, either the conductor or the magnet may be the moving part. All dynamos are based upon the fundamental discovery made by Michael Faraday in 1831. Faraday discovered that, if a wire forming a part of a circuit is moved across the space (called a magnetic field) in front of the pole of a magnet, an electric current will be set up in the wire and circuit during time of motion. The modern dynamo consists of two essential parts: (1) an electromagnet or system of electro-magnets called the field-magnets and (2) a system of copper wires, usually wound on a laminated iron core. This system of conductors is called the armature, and is the part in which the current is generated. In most varieties of dynamos the armature revolves in the magnetic field of the field-magnets, but in many large alternating-current dynamos the field-magnets form the revolving part.

Dynamos are divided into two general kinds: direct current (D. C.) and alternating-current dynamos (A. C.) or simply alternators. The current generated in the circuit of a D. C. dynamo is constant in direction and magnitude. The current produced by an alternator reverses direction at regular intervals. All commercial D. C. dynamos have a commutator. This is a metal cylinder built up of a number of insulated sectors or bars, which revolves with the shaft on the armature. Fixed conducting-brushes rest against this commutator and make the connections with the external circuit. The armature-coils are connected with the commutator-bars, so that the connections with the external circuit are reversed as often as the current in the armature is reversed. In this way the current in the external circuit



SIMPLE DIRECT CURRENT DYNAMO



SIMPLE ALTERNATING CURRENT DYNAMO

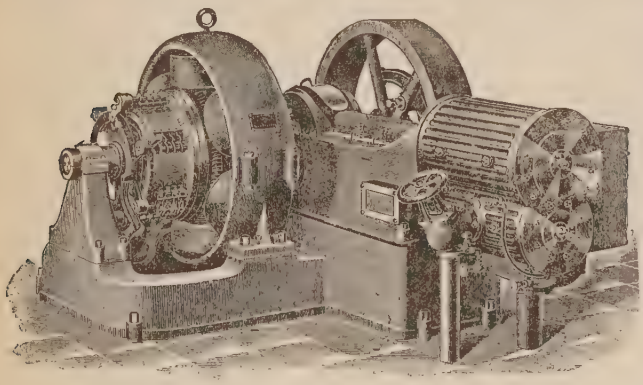
is kept constant in direction. The collecting device for a simple A. C. dynamo consists of two insulated copper-rings on which the brushes rest. The current in the external circuit is thus reversed as often as the current in the armature-coil is reversed. The common number of alternations or reversals (often called cycles) in commercial alternators is either 125 or 60, but as low as 25 are used in the Niagara Falls electric plant.

Alternators are often built to generate two or more alternating currents, which differ in "phase." Such machines are called two- or three-phase alternators. Thus a two-phase machine is one which generates two separate alternating currents, the two currents differing in that the first reaches its maximum when the second is at zero, and when the second reaches a maximum the first is passing through its zero, and so on. Apparatus generating and using two or more phases is called polyphase apparatus.

The use of alternating currents has increased very largely within recent years, because of the inventions of transformers and of the induction-motor. The polyphase alternating-current system is the only one commercially feasible for long-distance transmission of electric energy

(see TRANSFORMERS and TRANSMISSION OF POWER), and even for many shorter lines there are engineering advantages in its use. The field-magnets of some of the earlier dynamos were permanent steel magnets, and such machines were called magneto-electric machines or magnetos. The little dynamos used in telephone call-boxes are magnetos. The field-magnets of all modern machines are electro-magnets. The machine is spoken of as bipolar or multipolar, according as the field-magnet system has two or more poles. The field-magnets of most alternators are separately excited by an electric current from a small auxiliary dynamo called the exciter. The field-magnets of most D. C. dynamos are excited by the current generated by the dynamo itself. If all the current of the armature passes through the field-coils, the dynamo is said to be a series-wound machine; if only a fraction of the armature-current goes through the field-coil, the dynamo is a shunt-wound machine. When there are two sets of field-coils, a series-set and a shunt-set, the dynamo is said to be compound-wound. The choice of the kind of field-windings is a question of regulation of the current-output with different loads.

Dynamos are rated in kilowatts as steam-engines are rated in horse-power. A kilowatt (K. W.) is almost exactly equal to one and one third H. P. Thus a 75 K. W. dynamo has the same work-capacity as a 100 H. P. steam-engine. To get the K. W. of a dynamo, divide the product of the volts and amperes by 1,000. The use of electrical machinery for power-purposes has made a demand for large dynamos, often reaching several thousand K. W. for one machine. Thus in the Niagara Falls plant there are ten machines, each of 5,000 K. W. output.



DIRECT CONNECTED DYNAMO AND ENGINE

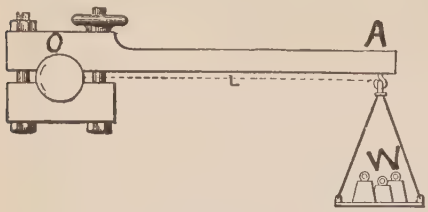
Faraday and others saw immediately that his discovery of electromagnetic induction (1831) could be used for the continuous production of electric currents, but the modern machine was evolved slowly and represents the added ideas of more than a generation of inventors. The first machine had permanent magnets. In 1832 Pixii devised a commutator. In 1848 Brett suggested the self-exciting electromagnet for the field. The name dynamo-electric machine was first given by Dr. Werner Siemens in a paper read before the Berlin academy in 1867. In 1870 Gramme invented the ring-armature, and three years later Hefner-Alteneck improved the early form of Siemens armature and gave us the present drum-armature. The ring- and drum-armatures have been used more than any others in D. C. dynamos. The theory of the dynamo-machine has been studied carefully by Hopkinson, Steimetz, S. P. Thompson and others, so that the designing of a dynamo for any specific purpose has been reduced to a question of exact calculation. The efficiency of modern dynamos is often 96 to 98 *per cent.* The largest makers of dynamo-electric machinery in the United States are the General Electric Company, and the Westinghouse Electric and Manufacturing Co.

The shops of these companies are among the largest manufacturing-plants of any kind in the world.

A. P. CARMAN.

Dy'namom'eter, strictly an instrument to measure a force tending to produce motion. Thus, a spring-balance is sometimes called a dynamometer. The term, however, is commonly applied to an instrument to measure power. Power is rate of doing work. Work is force overcome through distance. The unit of work used in engineering is the work done in raising a pound-weight one foot against gravity, called a foot-pound. When a machine does work at the rate of 33,000 foot-pounds in one minute, the power is one horse-power (H. P.). The power-unit used by electricians is a kilowatt (K. W.), equal to $1\frac{1}{3}$ H. P. A dynamometer is technically used in engineering for any device which measues H. P. One of the simplest and most common forms is the Prony brake. A block B is clamped fairly tight on the pulley O of the machine. The machine then does work against friction. The force is balanced by the weight W on the lever-arm AO. From the speed of rotation, the lever-arm and the force W, the power is directly calculated. For the many forms of dynamometers, see J. J. Flather's text-book on *Dynamometers.* A wattmeter measures electrical power in watts. It is an instrument for measuring the product of the

pressure (volts) and current (ampères), which gives the watts directly. The best



PRONY BRAKE

known forms are those of Siemens and the modified forms of Weston.

Dyne (*dīn*), the unit of force employed in the metric system. It is defined as that force which, acting upon a mass of one gram, will produce unit-acceleration. If we denote the acceleration of gravity by g, then the weight of one gram is equal to g dynes. And, in general, we may say that the weight, W, of any body whose mass is m grams is mg dynes, or

$$w = mg \text{ dynes}.$$

A definition of the dyne which is exactly equivalent to that given above is the following: That force which, acting for one second, will produce unit-change of velocity in a mass of one gram. A *megadyne* is a force of one million dynes, and is about two *per cent.* greater than the weight of a kilogram.

E

E, the fifth letter, is a vowel. It represents seven sounds, the principal ones being the long sound in *eve* and the short sound in *best*. Variations of long *e* are heard in *event* and *eight*, of the short *e* in *excuse* and *horses*, the absence of accent on these *e's* affecting their quality. Other *e* sounds occur in *ever*, *where*, *whereby*. *E* at the end of words usually is silent, but indicates that the preceding vowel is long, as in *came*. Final *e* after *c* and *g*, as in *lace* and *rage*, shows that *c* is *s* and *g* is *j*. *E* occurs in English words far more frequently than any other letter. Its *ā* sound comes from the Latin.

Eads (*ēdz*), **James Buchanan.** Men with genius for mechanics, as for art, usually give indication of it very early in life. This famous engineer, who built the Eads bridge across the Mississippi at St. Louis, constructed models of saw-mills, fire-engines and steamboats before he was ten years old. He was born at Lawrenceburg Indiana, in 1820. This was before the day of railroads. The commerce of the country was carried on over the waterways, and the Ohio swarmed with every kind of boat that was in use. Perhaps this is the reason the man came to be identified with rivers; the deepening of their channels the bridging of them, the construction of boats, the protection of their banks from erosion.

When he was 13 the family moved to St. Louis, where river life was on a larger, more dramatic scale. One of the first things he did to attract attention was the raising of wrecked boats, for which work he invented improved hoisting-machinery. When the Civil War broke out, he was called to Washington and given a commission to build iron-clad gunboats to patrol the Mississippi. His feat of building and equipping eight such boats in 100 days gave him world-wide fame. From 1867 to 1874 he was engaged in bridging the Mississippi. The Eads bridge is still considered the finest example of metal-arch construction in existence. His next undertaking was the improvement of the South Pass of the Mississippi delta by the use of jetties. Congress approved of his plans to introduce the jetties all the way up to the mouth of the Ohio, but the cost was enormous and the work was never completed. Mr. Eads also proposed to build a ship-railway and then a ship-canal across the Isthmus of Tehuantepec, Mexico. Had he lived, this route might have been adopted rather than Panama. He died at Nassau, Bahama Island, March 8, 1887. He received the Albert medal from Queen Victoria and many other decorations and honors from governments and universities. His ashes were scattered on the flood-waters of the Mississippi, according to his will, from the Eads bridge, his only monument.

Eagle, a large bird of prey, related to buzzards and vultures. There are forty or fifty species of eagles in all countries of the world, but only two kinds occur in North America. These are the golden eagle, common to Europe, Asia and America, and the baldheaded eagle, which is peculiar to North America. The golden eagle is a magnificent, mountain-loving bird; it is found in the United States from Mexico northward, but is far from common. It

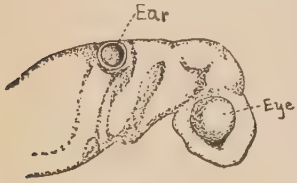
IMPERIAL EAGLE

is more abundant in the Old World, but there the sea-eagle is a more common bird. The golden eagle is a large bird of brownish color, the feathers of the head and neck appearing golden in the sunlight. It attains a length of three and one-half feet, and nine feet in spread of the wings. Its food is hares, ducks, lambs, small pigs and the young of other animals, which it carries away in its talons. It lays two or three whitish eggs with brown spots, usually on inaccessible cliffs. The baldheaded eagle belongs to the group of the sea-eagles and lives near water; it is found on rivers

and lakes and especially along the sea-coast. It is slightly smaller than the golden eagle, having an expanse of wing of about eight feet. The feathers on the head and upper part of the neck are white, which gives it the name of baldheaded. It feeds largely on fish, sometimes catching them for itself, but, when opportunity offers robbing the fish-hawk or osprey. It frightens the osprey into dropping the fish which it has caught, and then catches it in its own claws before it reaches the earth. These birds usually nest in high trees, and lay two eggs of dull white color. Among other varieties are the harpy-eagle, the serpent-eating eagle, etc. Eagles are supposed to attain a great age. They have long stood as the emblems of war and power, and have been the standards of war in several countries. The famous war-eagle of the United States—Old Abe—was stuffed and preserved in the state-library at Madison, Wis.

Eames, Emma (Mrs. Julian Story), American soprano singer, also famed for her beauty, was born at Shanghai, China, Aug. 13, 1867, and is the daughter of an American lawyer then employed in the international courts at Shanghai. Her early years were spent at Bath, Me., her musical studies being directed by her mother, and under instruction in Boston. In 1886 she proceeded to Paris, where she was a pupil of Mme. Marchesi, and appeared in 1888 at the *Opéra Comique*, and in the following year made her debut in grand opera in Gounod's *Romeo et Juliette*. She sang with Mme. Patti and with the brothers De Reszke, and met with great success. In England she appeared at the Covent Garden theatre, London, in her impersonation of *Marguerite*. In the United States she added to her high reputation as a prima-donna, and won fresh laurels under Herr Grau, in her famous operatic parts, including Wagnerian rôles. Her repertoire is extensive, and not only English but in French, German and Italian. In 1891 she married a son of W. W. Story, the well-known American poet and sculptor. In 1908 they divorced, and in 1911 she married Emilio de Gogorza, an eminent baritone.

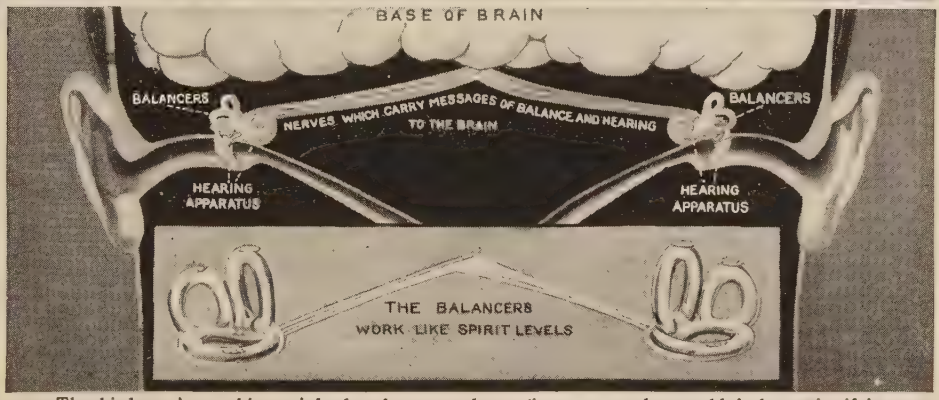
Ear, the organ of hearing, especially adapted to receive sound-vibrations from the air. The ear is merely the receiver; it must of course be connected with the brain by the nerve, otherwise there is no hearing. The parts of the ear are thrown into vibration by the sound-waves, and these vibrations are conveyed by the nerves to the brain. If the nerves are destroyed and all the other parts left perfect and uninjured, there, nevertheless, is no hearing. Receiving organs of this kind are placed on the surface in order that they may be in contact with the external world. They are called end-organs or sense-organs. The ear is one, the organs of sight, smell, taste and touch are others. Ears are found very low in the scale of animal life In the simpler forms they consist of little bags filled with fluid, in which are small, hard particles called ear-sand or ear-stones. The shaking of the bag causes the fluid to vibrate, and the ear-sand is also put in motion, which increases the effect upon the nerves of hearing. In all the vertebrated animals the ear, in common with the other sense-organs, begins on the surface as a patch of the outer cell-layer. There are two round patches on each side of the head, which become sunk in like small saucers (see illustration). The ear starts in this way in all fishes, amphibia, reptiles, birds and mammals. In this stage it is called the ear-saucer or ear-pit. Soon it begins to close by the growth of the skin over it; it becomes a sort of pocket, at first open and then closed, after which it is called the ear-vesicle. From this ear-vesicle, which is little more than a sac, arise gradually all the other parts of the inner ear. In the higher animals three parts are recognized: an outer, a middle and an inner ear. The outer ear includes the part that can be seen and the tube leading inward from the surface. Ear-wax is formed within the tube, and a membrane is stretched across its inner end, called the tympanic membrane. The middle ear is a space filled with air, bounded by the membrane on the outside and the bony wall of the internal ear on the inside. The space is crossed by a chain of three small bones, called the hammer, the anvil and the stirrup. The hammer is fastened to the tympanic membrane, and the stapes to a small oval membrane which covers one of the small openings through the bone into the bony cavity that contains the inner ear. The cavity of the middle ear also communicates with the throat through a passage called the Eustachian tube.



Head of embryo shark showing beginning of ear

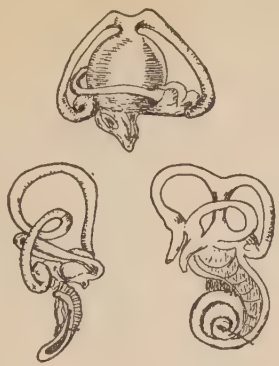
In reptiles and birds there is a single long bone in the middle ear, instead of three bones as in the higher animals. The inner ear is the essential part, in fishes the only part. The middle ear is gradually developed and the external ear added to it as we go up the scale of animal-life above the fishes. The inner ear consists of an upper portion from which three semicircular canals arise, and an inner part which in the higher animals is coiled like a snail-shell and called the cochlea; but this part is fully developed only in mammals (see illustration). The illustration shows the inner ear of a reptile, a bird and an ox. Notice that in the

THE BIRD MAN AND HIS EARS



The bird-man's machine might be almost ready to tip over and he wouldn't know it, if it were not for his ears. When above the clouds, he can't see the horizon and so his eyes don't tell him when his machine is tipping. He must depend on his sense of balance located in six little tubes, three on each side of the head. We all have them, but unless they are in good working order, we could never learn to fly. They work like spirit levels. Inside of these tubes, which are filled with water, are hollow nerve fibers also containing water. When we tip our heads the water shifts and tells the brain in what direction we are tipping. So before a young man is allowed to train for flying service in the Army, he is examined very carefully to make sure he has the proper sense of balance.

reptile there is no cochlea, only a small projection in place of it; in the bird this projection is longer and curved; and in the ox it has become long and coiled like a snail-shell — the true cochlea. The semicircular canals are present in all three. It is in the cochlea that the most complicated structures are found. The principal branch of the ear-nerve enters here, and becomes connected with certain large cells provided with hairs that vibrate when sound-waves reach them. The whole is inclosed in very hard bone, so that there are a bony part and a membranous part to the internal ear. The membranous part consists of closed sacs full of fluid, and these are also surrounded by a fluid. Thus the arrangement is exactly suited to receive vibrations and transmit them to the ear-nerves. In the cochlea are many little organs, standing side by side on a membrane and forming an arch or tunnel by arching toward each other. These are the organs of Corti. They vary in size, and possibly respond to different sets of sound-vibrations; but, on the other hand, it is possible that they simply act as dampers, somewhat like those in a piano, to prevent the too long vibration of the parts of the membrane upon which they rest. For fuller descriptions of the ear see text-books on anatomy and physiology. See, also, SOUND.



The inner ear of a reptile (above), a bird (to the left), and an ox (to the right)

Early (*ēr'lĭ*), **Jubal Anderson,** a Confederate general, was born in Virginia in 1816. He graduated at West Point and served in the Florida and Mexican Wars, and was practicing law when the Civil War broke out. He entered the Confederate service as a colonel, and was in the battles of Bull Run, Fredericksburg and Gettysburg. He was defeated by Sheridan in several battles and also by Custer at Waynesboro, after which he was relieved of his command. He died at Lynchburg, Va., March 2, 1894.

JUBAL A. EARLY

Earth is the name given to the third planet in order from the sun. Like other members of the solar system, it revolves in an elliptical orbit, in one focus of which is the sun. The average distance of the earth from the sun is 92,800,000 miles. The earth has one moon, at a mean distance of 238,800 miles. It was anciently believed that the earth was a flat disk of land surrounded by water. It is now known that it has approximately the form of a sphere. On a wide, smooth surface, such as the sea, the upper part of a distant receding object, as a ship, remains in sight after the lower part has disappeared. This could be true only if the earth were round. The position of the stars shows the same thing. If one travels south, new stars, which before could not be seen, rise into view. Another very convincing proof is the fact that vessels steering always in the same general direction have gone round the earth, coming back to the point from which they started. The earth is not a perfect sphere, but is flattened slightly at the poles. If it were a perfect sphere, the arc of the surface, corresponding to a definite angle at the earth's center, would be equal in every part of the circumference. But it is found that an angle of one degree has a longer arc toward the north and toward the south than near the equator, thus showing that the polar regions are flattened and the equatorial regions bulge out. Delicate experiments also show that the force of gravity is greater near the poles than at the equator; but this can be true only if the center of the earth is closer to the other attracting body at the poles than at the equator; that is, the polar regions must be flattened so as to lie nearer the earth's center than is the equator. The shorter diameter of the earth is 7,899.6 miles, while the equatorial diameter is 7,926.6 miles. The character of the earth's interior can be inferred from certain tidal phenomena which have led Lord Kelvin to the conclusion that the rigidity of the earth is greater than that of glass. Estimates regarding the age of the earth vary enormously. Kelvin places it somewhere between 20 million and 400 million years.

The earth has four principal motions: that of rotation on its own axis; that of revolution around the sun; that of precession; and that of nutation. As it rotates on its axis half is always exposed to the sunlight and half is always in darkness, one rotation being made every 24 hours. The time taken for the revolution of the earth around the sun is 365¼ days, and forms our year. If its axis were exactly perpendicular, the days would always be the same length. But in fact its axis is inclined at

an angle of 23½°; and thus, when the northern end of the axis is directed away from the sun, the rays of light and heat do not reach it, but, on the other hand, the sun's rays continually shine upon the southern end. This period is the winter of the northern hemisphere. When the earth has moved a quarter of the way around its orbit, the sun's rays reach both the north and south poles. At the end of the second quarter of its revolution—or the summer solstice—the northern end of the axis is inclined toward the sun, and thus is continually lighted; while at the third quarter of the revolution once more the light reaches both poles. In the first position, the further north we go the shorter is the time during which the sun's rays touch any one point, and thus the days are short and the nights long; and, as the days are short and the sun shines only for a short time, the weather is cold. This is the season of winter. Now, as the earth moves through the first quarter of its orbit, the days become longer on the northern hemisphere and shorter in the southern, till they become just equal about the 21st of March. This is called the spring-equinox. At the end of the second quarter the days are long in the north, the nights short and the season therefore warm; and at the third quarter once more the length of days and nights becomes equal, about September 23. At the summer-solstice of the northern hemisphere, when the north pole is inclined toward the sun, sunlight falls 23½° beyond the pole, and, as the earth rotates, all this region remains in daylight the whole 24 hours. At this time the south pole is turned away from the sun to the same extent. The circles bounding these regions of continuous daylight or darkness at the solstices are called the Arctic and Antarctic circles, and the spaces within them the north and south frigid zones. At the same time the sun is vertical at a distance of 23½° north of the equator. This is the highest northern latitude at which the vertical sun is experienced, and is called the tropic of Cancer, from the constellation in which the sun appears at that time. At the winter-solstice of the northern hemisphere the sun is vertical at a distance of 23½° south of the equator, or on the tropic of Capricorn. As the sun appears overhead in all places between these tropics twice in the year, and thus exerts its greatest heating power, this broad belt of the earth is called the torrid zone. The belts between the tropics and the polar circles are called the northern and southern temperate zones.

The sun's heat is constantly at work breaking down the higher rocks and spreading the broken matter as soil over the lower ground. The circulation of water is the great instrument for this work: vapor raised from the oceans and carried by winds is condensed as rain on the highlands, and, returning to the sea in the forms of springs and streams, has a chief share in wearing down the surface of the land. This process would finally reduce the land to a common low level, were it not counteracted by the continual gentle elevations and depressions of the surface, due to internal changes. Animal and vegetable life is spread all over the globe and has had a large share in producing the condition and aspect of many parts of the earth, as is witnessed by the great coal-fields of the earth, the chalk, limestone and marble found in many regions and the coral reefs and islands of tropical seas. Man, too, has helped to change the appearance of the face of the earth.

The average density of the earth is about five and one half times as great as that of water. Since the density of the earth's crust is very much less than this, it is not unlikely that the interior of the earth has a density as high as 7 or 8 and that it is composed largely of metals.

Some of the articles which will be useful in this connection are AFRICA, AMERICA, AUSTRALIA, EARTHQUAKE, EUROPE, GEOLOGY, GLACIERS, GRAVITATION, PACIFIC, PLANETS, SUN, TIDES, VOLCANO.

Earthquake, a name given to any very considerable and very sudden disturbance of the earth's crust. Since the late Lord Kelvin showed that the earth is more rigid than steel, it is not surprising that a disturbance at any point in the earth's crust should be propagated rapidly to distant parts of the earth. Concerning the character of the original disturbance very little is known; the slipping of one layer of rock over another and the falling of great masses in the interior of a mountain or volcano have been suggested. But concerning the vibrations which are propagated from one part of the earth to another a great deal has been learned within the last few years by means of the seismograph, an instrument which records both the character and the time of the disturbance at any one point. The principle upon which these seismographs are constructed is simply that of an ordinary gate standing halfway open. If the post to which the gate is hinged be shaken to and fro, the center of gyration of the gate will remain fixed If now a style be attached to the gate, it will trace out a line on the ground (which moves with the post); and this line will be a description of the displacement perpendicular to the direction of the gate. Now, a typical seismograph contains two open gates with heavy masses at the outer ends, each gate being at right angles to the other so that both components of any horizontal disturbance are obtained. A third heavy mass capable of motion only in a vertical

direction records the vertical disturbance. By recording the same disturbance at two different stations it is frequently possible to compute the speed of earthquake-waves. Seismographs are now made of such delicacy that Professor John Milne has succeeded in England in observing earthquakes which had their origin in Japan. The destructiveness of an earthquake is not measured by the amplitude of the disturbance of the particles of the earth at any point but by the speed of these particles. A small to-and-fro motion may be very disastrous if it is rapid; while, on the contrary, a large displacement may be harmless if the motion is very slow. Two of the most disastrous historic earthquakes include one in Sicily, in 1693, which engulfed some 100,000 persons, and one at Yeddo, which proved destructive to 200,000 inhabitants.

Among some of the more important earthquakes of recent times the following may be mentioned:

In 1745 Callao in Peru was destroyed by a severe earthquake, at which time 220 shocks were recorded in 24 hours. A vast tidal wave rose 80 feet and swept over the town. In 1755 occurred the famous Lisbon earthquake. In this case also a great tidal wave was the most disastrous feature. When the wave subsided the city took fire, and within a few hours between 30,000 and 40,000 persons lost their lives. In 1783 Calabria and in 1779 Quito suffered from severe earthquakes, entailing a loss of life exceding 100,000. In 1811 the town of New Madrid, on the lower Mississippi, was terribly shaken, the earth undulating for a distance of 300 miles. Almost at the same time Carácas, in Venezuela, was overthrown and 12,000 of its inhabitants buried beneath the ruins. In 1822 Aleppo, in 1857 Calabria, in 1860 Mendoza in the Argentines and in 1861 Peru and Ecuador were frightfully afflicted. Again, in 1883, the island of Krakatoa in Sunda Strait was visited by a volcanic eruption which cost the lives of more than 35,000. That same year the isle of Ischia near Naples suffered a severe shock, which completely ruined four towns and destroyed 2,800 people. In 1886, on the night of Aug. 31, five destructive shocks were experienced at Charleston, S. C. Crevices were opened several yards in length and a few inches wide, some of which threw out water to a height of several feet.

On the 28th of October, 1891, occurred the great Japanese earthquake. The shocks were felt over almost the whole of the island of Nippon. The principal shock, while lasting only two minutes, was extremely destructive. The volcanic Mt. Haku-San shot out masses of stone and mud. Cracks and fissures opened, and in some places the ground subsided. The top of the sacred Mt. Fujiyama was torn asunder, and a chasm 1,200 feet wide and 600 feet deep formed. It is estimated that 6,500 persons were killed and 9,000 injured, while 75,000 houses were destroyed and 12,000 damaged. The more recent earthquake-disturbances are those in 1896 in Japan, involving a loss of 26,000 lives; in 1905 in India, involving a loss of 15,000 lives; the disastrous upheaval at San Francisco, on the 19th of April, 1906, followed by the burning of a large portion of the city; and the partial destruction of Valparaiso, Chile, in August, 1906. When the city was devastated, property to the value of $200,000,000 was destroyed and there was an appalling loss of life.

A most destructive earthquake occurred in southern Italy Dec. 28, 1908. The city of Messina in Sicily was entirely destroyed, with 60,000 dead and 80,000 injured. Reggio in Calabria and numerous smaller places were badly damaged. The total loss of life was over 76,000.

Earthworm, the common angleworm that burrows in the earth. The surface of the body is provided with small bristles which aid in crawling and in burrowing. The body is divided by furrows into a number of rings; those in front are larger than those in the middle and those behind are flatter, so that one can easily tell the head-end and the tail-end. The earthworm, although to general appearances so low in the scale of life, is wonderfully constructed, and is provided with organs of digestion, circulation, nervous life, etc. The digestive system is a muscular tube running through the body, having a crop and gizzard in its course; the front end of it is capable of being thrown out and drawn by a set of muscles. The food consists of animal and vegetable matter mixed with the soil, for example, minute fragments of old leaves, etc. Therefore the earthworm fills its alimentary tube with earth in which are scattered particles of animal and vegetable matter. The food is digested and absorbed into the system, and the earth is voided again. In this way these worms work the soil over, and their influence is greater than one would at first suspect. Darwin showed that in an acre of garden, on an average, as much as fifteen tons of soil would pass through their bodies in a year. They also bring vegetable mould to the surface, and bury objects thrown upon the ground, at the rate of two inches or more in ten years. They have been important agents in burying ancient cities, temples, columns, coins, etc. They also are very beneficial to the soil in loosening it and working it over. They have a set of coiled tubes, a pair in each joint, except the first three or four, that remove from the body the worn-out material, and correspond to the kidneys of higher animals. These organs are char-

acteristic of worms. The nervous system consists of a mass of gray nervous matter in the head, united by strands around the throat to a long cord of nervous matter running along the under surface of the body. The nerve-trunks are connected with this central cord, those of the head-end uniting with the brain, those from the rest of the body with the ventral cord. The earthworms have no eyes, but the entire fore end of the body is sensitive to light. They feed mostly at night, crawling from their burrows, and their places may be discovered by tubular castings of earth. There are many other worms composed, like the earthworms, of a series of rings. It is probable that the parentage of vertebrated animals was from simple animals somewhat like these ringed worms. No one thinks that the worms of to-day represent the ancestors of vertebrates, but it is generally believed by naturalists that the vertebrated animal came from very simple forms many thousand or million years ago, and those early remote parents were probably in structure somewhat like the living ringed worms. See Darwin: *Formation of Vegetable Mould.*

Easter, the festival of the resurrection of Jesus Christ, probably derives its name from Eastre, a Saxon goddess, whose festival was kept about the same time as Easter. In the ancient church, the celebration lasted eight days, but in later times it was limited to two or three days. It was a festival of pleasure; alms were given to the poor and slaves were often freed. Daily services were held during the whole week before Easter, and on Easter Day the people greeted each other with a kiss, saying: "He is risen," to which the reply was made: "He is risen, indeed;" and this custom is still kept up in the Greek church. The custom of exchanging eggs as a symbol of resurrection or renewed life is very old. Easter Day is always the first Sunday after that full moon which comes upon or next after the 21st of March (the beginning of the old church-year), the full moon being understood to be (though not accurately) the 14th of the calendar moon. If the full moon comes on Sunday, Easter Day always is the Sunday after.

Eastern Empire. See ROME and BYZANTINE EMPIRE.

Eastern Townships. This name is applied to a large portion of southern and eastern Quebec, lying between the American frontier and the older French settlements on the St. Lawrence River. It was populated by United Empire Loyalists after their expulsion and voluntary exile from the United States upon the conclusion of peace with the mother-country in 1783, and forms a distinctively English element in the French province.

East India Company. The East India trade dates from the time when the Portuguese navigator, Vasco da Gama, having effected the eastern passage to India by doubling the Cape of Good Hope, cast anchor off the city of Calicut, May 20, 1498. Though the Portuguese did not start a formal trading-company, they held sway in the seas they had opened during the whole of the 16th century. In the next century their place was rapidly taken by the Dutch, whose first vessel had rounded the Cape in 1596 and whose East India Company was founded in 1602. But the earliest incorporated East India Company was the English, to which Queen Elizabeth granted a charter on the last day of the 16th century. Several later English companies, after a brief period of rivalry, were united with the original company under the title of The United Company of Merchants of England Trading to the East Indies. In the 17th century the Dutch crowded the English out of the islands where all the European powers had gained their first footing, and so settlements were founded by the English on the coasts of the Indian peninsula. Madras, Bombay and Calcutta were founded one after the other. Properly speaking, the company were only merchants exchanging the products of the east and west, but soon they were drawn into the quarrels among the native princes, which resulted in the establishment by England of sovereign powers over vast regions. The charter of this company was renewed again and again, but a feeling against the monopoly gradually grew up in England. In 1833 the company's exclusive trading-privileges were taken away, and from that time the government took a constantly increasing part both in trading and in governing the Indian dominion, though it was nominally done by the company. In 1858, after the Sepoy rebellion, the company was forced after great resistance to yield its powers to the crown; and Indian affairs are now managed by a secretary of state for India. French and Danish East India Companies have existed for short periods. See INDIA; and *India under British Rule*, by J. T. Wheeler.

East Indies, as distinguished from West Indies, include the two great peninsulas of southern Asia and all the neighboring islands from the delta of the Indus to the northern extremity of the Philippines. See INDIA and, for the Dutch East Indies, HOLLAND.

East'lake, Sir Charles Lock, a celebrated English artist, president of the Royal Academy, was born at Plymouth in 1793, and studied in London and Paris. He lived for some time at Rome, where he painted several pictures which attracted attention in England. In 1841 his great work, *Christ Weeping over Jerusalem*, was painted. He was elected president of the Royal Academy, and was knighted in 1850.

During a journey in search of pictures for the National Gallery, of which he was a director, he died at Pisa, Italy, in 1865. Eastlake gained a high reputation as a writer on art. Besides other works he published *Materials for the History of Oil-Painting* and a number of papers now published in *Contributions to the Literature of the Fine Arts*. See *Memoir* by Lady Eastlake, prefixed to the second series of his *Contributions*.

East Liverpool, O., a growing town in southeastern Ohio, whose trade chiefly consists of pottery-ware. It is in Columbiana County, on the Ohio River, and near the eastern boundary of the state. It lies about equidistant from Wheeling to the south and from Pittsburg, Pa., to the east. It is served by the Cleveland and Pittsburg Railroad. There are over thirty potteries in the town, manufacturing various wares, such as terra-cotta, granite, stone and earthenware, besides glass-works, foundries and machine-shops. Population, 20,387.

East'on, Penn., county-seat of Northampton County, situated at the meeting of the Lehigh and Delaware Rivers, is 67 miles from Philadelphia and a center of iron, cement and slate industries. Eight railroads and two canals give Easton a large trade. Its industries include the Ingersoll-Rand drill works, textile and knitting mills, brass, bronze, steel, iron and aluminum foundries, piano factories, rope, pump and horse-shoe works. It is widely known as the seat of Lafayette College which received its charter in 1826 and whose Anglo-Saxon and Early English Department is one of the best known in the country. Population, 30,623.

East Orange, N. J., a favorite residential city in Essex County, N. J., for the business men of New York, 12 miles distant. It is served by the Erie and Delaware, Lackawanna and Western railroads. It adjoins Newark to the west. It has, besides a great number of handsome suburban residences, good schools and commodious churches. Its growth has been considerable in the past decade. Population, 40,969.

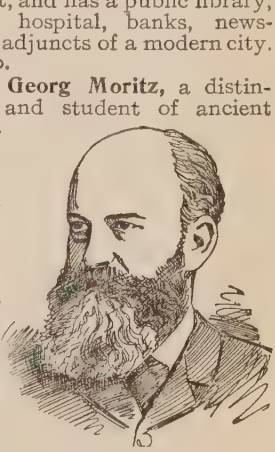
East Providence, a town in Providence County, R. I., diretcly opposite the city of Providence, on Seekonk River. The important industries of the town are linen-factories, bleacheries, chemical, electrical and wire-works. The town was incorporated in 1862. East Providence and Seekonk, Mass., once were a part of the town of Rehoboth. Population, 14,072.

East St. Louis, Ill., a city on the Mississippi, opposite St. Louis, Mo., and connected with it by a steel bridge across the river. East St. Louis is on 27 main-line railroads and is near some of the largest bituminous mines in the state. It is a larger horse and mule market than Chicago and its stock-yard industries are very extensive; it also has car and machine-shops, foundries, breweries, glass-factories, sugar-mills, steel plants, etc. The total manufacturers' pay-roll is $20,000,000. There are 6 banks, 75 miles of paved streets, 38 schools, 40 churches and the Howe Literary Institute. The population is 80,000.

Eaton, Timothy, an eminent merchant of Toronto, Canada. Receiving his education and business training in the north of Ireland, he came to Canada in 1857, and after a brief experience in a country village established himself in Toronto. He was a man of integrity and great energy and personal force were potent factors in his success. He conducted his business on lines of absolute honesty and fairness to his customers, giving value in price and quality of goods, dealt on a cash basis, cut out middle-men and in all respects adopted modern methods. He thus not only built up for himself a business reaching from the Atlantic to the Pacific, but also wrought a revolution in the entire retail business of the country. Few men have accomplished as much for the commercial life of Canada as this young immigrant of 1857. The immense business he founded is now successfully continued at Toronto, Winnipeg and other places by his son, John C. Eaton.

Eau Claire, Wis., a city in western central Wisconsin, the capital of Eau Claire County, situated on the Chippewa River at the mouth of the Eau Claire. The two rivers divide the city into three sections. Three lines of railway give facilities to its trade, which is largely of lumber. Its industries embrace, besides iron and linen goods, furniture, shoes, paper-mills, machine-shops, foundries, flour-mills; but lumber is its chief export. It has a number of grain-elevators and saw-mills, sash, door and blind-factories, etc. The city is prominent as a summer resort, and has a public library, a high-school, a hospital, banks, newspapers and all the adjuncts of a modern city. Population, 18,310.

Ebers (*ā'bĕrs*), **Georg Moritz,** a distinguished novelist and student of ancient Egyptian life, was born at Berlin, March 1, 1837, and devoted himself to the study of Egyptology. He made a long journey to the east, and in 1870 was made professor of Egyptology at Leipsic. His most important and learned works are *Egypt and the Books of Moses* and *Through Goshen to Sinai*. He also wrote a number of historical novels, which have much value



GEORG M. EBERS

in regard to the life of early Egypt. The most famous of these is *Uarda*. Others are *An Egyptian Princess*, *Homo Sum*, *The Burgomaster's Wife* and *The Emperor*. He died on Aug. 7, 1898.

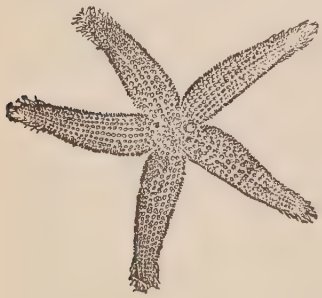
Eb'ony, a species of *Diospyros*, plants of the ebony family. The American representative is the common persimmon (*D. virginiana*). There are 180 species in the tropics and a very few in the temperate regions. Most of the species have valuable hardwood, but it is from certain of the tropical ones that the commerical ebony is obtained. *D. ebenum*, a tree becoming about 50 feet high and growing in the East Indies, is said to yield the best ebony.

Ebullition. See EVAPORATION.

Ecbatana (*ek-bat'a-nă*), the capital and chief fortress of Media, situated one and a half miles from Mount Orontes and at the foot of a hill crowned with the royal citadel and a magnificent temple of the sun. According to Herodotus, Ecbatana was founded about 700 B. C. and surrounded with seven walls, each higher than the one next outside it The inmost wall inclosed the citadel with the treasury. The city was taken by Cyrus in 550 B. C., and became the chief seat of his government. It was a favorite summer-residence of the Persian kings, and Alexander the Great stayed there for some months in 324 B. C. After his death it became a mere provincial town, but under the Parthians it again became a summer-home of kings. It again sank into insignificance till the Mohammedan period, when the modern city of Hamadan was built on the site of the ancient city. There were six other Asiatic cities to which the name Ecbatana was given by Greek writers.

Ecclesia (*ĕk-klē'zĭ-ȧ*), a popular assembly, especially of Athens, where the people had full sovereignty and at which every citizen of 20 years of age could vote. The Athenian ecclesia held originally four but finally 40 ordinary meetings in the year. The term was also given to the Jewish state, and so came to be used by New Testament writers to mean the church.

Echinodermata (*ē-kī'nō-dĕr'mȧ-tȧ*), the subkingdom of animals; containing starfish, sea-urchins, sea-cucumbers and crinoids. As the name implies, they all have a spiny skin. They are all inhabitants of salt water. The common starfish (see illustration) has five arms radiating from a central disk. At the end of each arm is a little red eye-spot; on the back is a rounded tubercle through which water enters the body; on the lower surface, in the center of the disk, is the mouth; and along the middle of the arms, in grooves, are the tube-feet used in locomotion. Other varieties of starfishes are the brittle stars, the basket-fish, etc. The starfishes form one class of the subkingdom. The sea-urchins form another class. The common sea-urchins are rounded and have a hard, limy, outer case that is covered with numerous spines (see illustration). When the spines are removed, the case is seen to be made of limy plates nicely fitted together. Five sets of these plates, passing like meridians around the shell, are perforated by little holes for the tube-feet, and five other rows of plates are not punctured. Inside the shell is a very complicated structure containing five teeth, the points of the teeth coming to the surface at the mouth; the rest of the apparatus is within the shell. It is often called Aristotle's lantern. Other kinds of sea-urchins are flattened, and are variously called sand-cakes, sand-dollars, etc Most of the starfishes and sea-urchins move by tube-feet, which are extended by water-pressure from within. A system of tubes, called collectively the water vascular system, carries water over the body. The tubes are arranged as follows: a central tubular ring about the mouth and five radiating tubes leading from it into the arms. From these main tubes smaller ones spring off, right and left, communicating with the tube-feet outside the body and with an equal number of rounded sacs within the body. The water enters through a sieve-like plate on the top of the body, and is carried by a tube to the central vessel around the mouth and then distributed through the rest of the system. The sea-cucumbers form another class. They have a long, plump body shaped like a cucumber, with tube-feet in rows along the body and a tree-like expanse at one end for breathing. The crinoids or feathered stars make another class. They have a body with branching process extending from it, all borne on



STARFISH

SEA-URCHIN

a stem which sometimes is very long. They are dredged from deep-sea waters in various parts of the world. The sub-kingdom *Echinodermata* is represented by many fossils in the rocks. The true position of the group among animals is not clear; but some of the larvæ of Echinoderms resemble those of worms, and this serves to relate them in a general way with the worms or to indicate that the remote ancestors of both groups were similar. See Romanes: *Jelly-fish, Starfish and Sea-Urchins.*

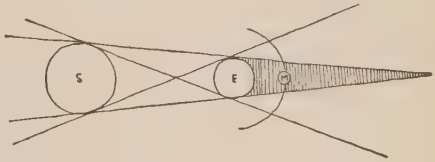
Echo, in Greek fable, a nymph employed by Zeus to keep the attention of his wife, Hera, by talking to her. Hera changed her from a nymph into a mere echo. She next fell in love with Narcissus, and pined away in grief for him, till nothing but her voice was left.

Echo, a phenomenon which is observed when a train of sound-waves strikes a large and fairly smooth body, such as a hillside or the side of a building. The phenomenon is identical in principle with that which occurs when water-waves strike a solid pier and are reflected, or with the reflection which occurs at a fret when waves travel along a guitar-string. Newton employed the echo in a cloister at Trinity College, Cambridge, to measure the speed of sound. Standing at one end of the cloister, he started a group of waves by stamping his foot. These waves were reflected at the far end of the cloister. The interval between the stamping of the foot and the hearing of the echo measures the time necessary for a sound-wave to make one round-trip of the cloister. From this interval and the length of the cloister the speed of sound is directly computed. The most interesting examples of echoes are, possibly, those which occur in the whispering-galleries, such as that in the dome of the Capital at Washington or in the dome of St. Paul's in London. For further details see Tyndall on *Sound.*

Eclipse, in astronomy, is used to describe the passage of one body through the shadow of another. When any portion of the earth's surface passes through the shadow of the moon, the phenomenon is called a solar eclipse. When the moon passes through the shadow of the earth, the phenomenon is called a lunar eclipse. When a satellite passes into the shadow of its planet, we have an eclipse of the satellite corresponding exactly to our lunar eclipse. When, however, the opaque planet or the opaque moon passes between us and the satellite, astronomers call this an occultation.

Conditions Necessary for a Solar Eclipse. The plane in which the moon revolves about the earth does not coincide with the plane in which the earth revolves about the sun; consequently there is not an eclipse of the sun once a month, but only when the moon passes through the plane of the earth's motion. Another condition also must be satisfied, viz., the moon must be "new," *i.e.*, must lie in the direction of the sun. Now it happens that these two conditions are met at intervals of about six months; so that we expect about two solar eclipses a year.

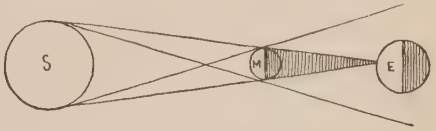
The moon and the sun subtend nearly the same angle as seen by an observer at the sur-



LUNAR ECLIPSE

face of the earth, so that the moon ordinarily barely suffices to cover the face of the sun. When the moon is in that part of her orbit nearest the earth, her angular size is greater than that of the sun and the eclipse is said to be total; when, however, the moon is in that part of her orbit most distant from the earth, her angular size is diminished, so that the face of the sun is not quite covered. An eclipse of this kind is called an annular eclipse. As was well-known to the ancients, the circumstances of any solar eclipse are repeated almost exactly in a period of 6,585 days and 8 hours (approximately 18 years). The result is that any solar eclipse is repeated every 18 years This is the period called the *saros.*

Lunar eclipses are of very little interest from a scientific point of view: but the phenomenon is so striking as always to command popular attention. In the case of the solar



SOLAR ECLIPSE

eclipse, however, we have our only opportunity to study the solar corona, a magnificent appendage of the sun having a diameter not less than 2,000,000 of miles. Previous to 1869 solar eclipses furnished our only opportunity to study the prominences, great outbursts of incandescent vapors which occur constantly on the surface of the sun. Every total solar eclipse is an event of interest and importance to scientists. Long journeys for purposes of observation are made by expeditions sent out by scientific bodies. Thus valuable data, including photographic records of every phase of the phenomena are secured. For details concerning eclipses see the *American Ephemeris* for two or three years proceding the eclipse. For an excellent account of the entire subject see Young's *General Astronomy*

Eclip'tic, in astronomy, the term applied to the apparent path of the sun in the heavens in the course of a year. It is the circle in the celestial sphere to which longitudes and latitudes are referred, and the circle in whose plane eclipses occur, since an eclipse cannot take place unless the moon be in or near the ecliptic. The circle of the sphere is inclined to the equinoctial at an angle of 23° 27′ 5″, and cuts it in two opposite points named the equinoxes. The angle of the inclination of the equator and ecliptic is a variable quantity, and is called the obliquity of the ecliptic. The result of this angle is the change of the seasons.

Ecology (*ē-kŏl'ŏ-jĭ*), often spelled œcology. In botany it is that division of the subject which deals with plants in relation to their environment. This environment includes both the physical conditions in which plants live and other plants and animals. There are two prominent phases of ecology. One considers the individual plant as it relates its organs to the environment. For example, the relation of leaves to light, of roots to the soil, of flowers to insects; the protection of various organs or the whole plant against drouth, cold, intense light, poor nutrition; the arrangements for the dispersal of spores and seeds; and many other subjects all belong to this phase of ecology. The other phase of the subject deals with plants associated together in what are called plant-societies. Plants are not scattered at haphazard over the surface of the earth, but are organized into definite societies or communities, as a forest-society, a meadow-society, a swamp-society, etc. These societies are determined by varying combinations of numerous factors, such as temperature, water, soil, light, wind, and they are as numerous as the possible combinations of these factors. This study of plant-societies merges into the study of the natural floras of the world, which are combinations of societies; and this in turn leads to the study of geographical botany. The study of the conditions which determine floras is often called floristics; while the combination of plant-societies, floristics and geographical botany is sometimes called phytogeography.

JOHN M. COULTER.

Ecuador (*ek'wä-dōr'*), a republic of South America, lying on the equator and bounded on the west by the Pacific, is thrust like a wedge between Colombia and Peru. It has a seaboard of 400 miles, but its other boundaries are not definitely settled. Its area is about 116,000 square miles, much of it being rich in mineral ores, including gold and silver. The Galapagos Islands also belong to it.

Surface and Drainage. Ecuador consists of three general divisions: the lowlands west of the Andes, the mountainous plateau of the interior and the elevated forest-country to the east. Very little is definitely known about the physical features of the country. The principal mountains either are or have been volcanoes. Many large rivers water it, the most important of which are the large branches of the Amazon.

Climate. The climate is warm but not wholly tropical, altitude neutralizing latitude and the snowline averaging 15,500 feet above tidewater. Cultivation reaches high altitudes, and the plain of Quito, nearly two miles above sealevel, is clothed in luxuriant vegetation. The intermountain regions have a temperate climate resembling perpetual spring. Constant heat and excessive moisture render eastern Ecuador essentially tropical. On the coast the rainy season usually lasts from December to May, but on the Amazon branches it rains nearly all the year round.

Agriculture and Animals. Ecuador is an agricultural country. In the southern regions, adjoining Peru and the Amazon valley, sugar-cane and oranges are cultivated, while in the northern regions, adjoining Colombia, are found wheat, barley, clover and beans. Wild animals of many kinds abound, and the country is the paradise of birds and insects.

Inhabitants and Religion. The whites, who are the landholders and merchants of the country, are hospitable and generally intelligent, but are apt to be lazy. The half-breeds are true savages, while the Christianized Indians are peaceable and contented, though many have sold themselves into slavery. Uncivilized tribes inhabit the country east of the Andes. The state religion is Roman Catholicism. There are many convents, monasteries and seminaries. Education is compulsory, but has not advanced far.

Manufactures and Railroads. Manufactures are limited to timber, coarse cloth, cassava-flour, kerosene and the preparation of spirits from sugar-cane and of flour from the yuca or cassava root. Guayaquil is famous for its hammocks and panama hats. Communication is effected by packmules on bridle paths, coastal steamers, a railroad from Guayaquil to Quito (268 miles) and 125 miles of wagon-road. The chief towns are connected by telegraph, and telephones are used in Quito and in several of the provinces. The exports are mainly coffee, cocoa, vegetable ivory and hides.

Government and Cities. The republic has passed through a series of violent revolutions since its establishment as an independent state in 1831. Under the last constitution there now are a president for four years, a vice-president, a cabinet of four ministers and a cabinet of state, besides a senate and house of representatives. The state is divided into three military districts, containing 17 provinces under governors.

Quito, the capital (80,000), has a university and an institute of sciences, and there are universities in Azuay and Guayas. The principal cities are Quito, Guayaquil and Cuenca. The population is 1,400,000. See *Travels in the Wilds of Ecuador*, by Simson, and *Four Years among Spanish-Americans*, by Hassaurek.

Edda (meaning *great-grandmother*), the name of two very different collections of old Scandinavian literature. The Younger or prose Edda was written between 1050 and 1133, and discovered in 1628. The Elder Edda is a collection of songs, mostly Icelandic. These are 39 poems which sing the praises of old Scandinavian gods and heroes. They belong probably to the 8th and 9th centuries. See *Iceland, Its Scenes and Sagas*, by Baring-Gould.

Eddy, Mary Baker, founder of the system known as Christian Science, was born at Bow, New Hampshire. She was educated in the public schools and by private instructors. In 1867 she announced and began to teach her system She organized the Church of Christ, Scientist, in Boston in 1879, was ordained to the ministry and founded the Massachusetts Metaphysical College in Boston, which was chartered in 1881. In 1883 she founded the *Christian Science Journal*. She is the author of *Science and Health with Key to the Scriptures* and many other works on the subject. The sect which she founded spread rapidly, and is now represented by churches in many cities She died Dec. 3, 1910.

Ed'dystone Lighthouse was first built in 1696–1700 on the group of rocks called the Eddystone, lying between Start Point and the Lizard in the English Channel, nine miles from the Cornish coast. The rocks are covered every day by the tide, and were the cause of many shipwrecks before the lighthouse was built. The first lighthouse was completely washed away in a storm in 1703, and the second was burned in 1755. The third was built of limestone incased in granite. The granite is dovetailed into the solid rock, and each block into its neighbor. It was shaped like an oak-tree and the light could be seen for 13 miles. The lighthouse was of great strength, but the sea began to wash away the foundation-rocks, and it thus became necessary to build another. The new one was put up in 1882, and is like the one before it, with the exception that it is higher and is equipped with newer apparatus. It casts a light for 17½ miles. See LIGHTHOUSE.

E'den, the name of the district situated in paradise. It lay in the east in the highlands of Central Asia. Many efforts have been made to discover just where Eden was, but scholars do not at all agree as to its precise location. The Aryan races, as well as the Hebrews, believed that the human race had its origin in the mountains of Central Asia.

Edge'hill, a hill or ridge in Warwickshire upon which was fought the first important battle of the Civil War in England, Oct. 23, 1642. King Charles intended to march upon London, but was met by the Earl of Essex with 10,000 of the troops of the Roundheads. The king's army was in number about 12,000, and was drawn up on Edgehill. Prince Rupert, who led the right wing of the royalists, charged with his cavalry the left wing of the Roundheads and pursued it for several miles; but meanwhile the right wing of the Roundheads drove back the royal infantry with great loss. The battle was indecisive, the royalist loss being the heavier.

Edgeworth, Maria, English novelist, was born in Oxfordshire, Jan. 1, 1767, and died near Longford, Ireland, May 22, 1849. She began to write fiction early in the 19th century, though she had previously taken an interest, with her father, in educational topics. Her chief stories, which treat mainly of the virtues and vices of humanity and have high moral aim, embrace *Popular Tales*, *Moral Tales*, *Castle Rackrent*, *Belinda Ormond*, *Tales of Fashionable Life* and an *Essay on Irish Bulls*.

Edict of Nantes. See HUGUENOTS.

Ed'inburgh, the capital of Scotland. It stands about two miles from the sea on a series of ridges, and is overlooked by Arthur's Seat and other hills. Arthur's Seat is a picturesque hill in Queen's Park, near the city, and its name is supposed to go back to King Arthur's time. It rises 822 feet above sealevel, and gives a view of great extent and wonderful beauty. Of the hills within the city the most important is Castle Rock. In the beginning of the 7th century Edinburgh is mentioned as the capital of the kingdom of Northumbria, and named after its king, Edwin. The city was made a borough by Robert Bruce, who also gave it the right to establish a port at Leith, two miles away. During the 15th century it began to be recognized as the capital of Scotland, and Parliament regularly met there. In 1544 the city was burned by the English. In 1561 Queen Mary came back from France, and the tragedy of her short reign was acted almost entirely in Edinburgh. It was at Holyrood Palace that Rizzio was killed; in Kirk-of-Field, near where the university now stands, Darnley was murdered; and in the chapel of Holyrood Mary was married to Bothwell. The union of England and Scotland, in 1707, drew away the Scottish nobility from Edinburgh, but the Pretender was welcomed there for a short time in 1745. Since then the city has spread far beyond its ancient walls, and has become famous as a center of scientific and literary activity. Its many fine buildings and picturesque situation,

extending up the hills which lie outside the old town, make Edinburgh one of the most beautiful cities of Europe. It is still representative of the capital of Scotland. It is the seat of the law-courts and of some of the departments of government. It is the center of much of the intellectual life of the northern kingdom, and it has long been known for its educational institutions. It is not a manufacturing town to any great extent, its most important industries being brewing and publishing. It returns four members to Parliament. Population, 320,-239. See *Old Edinburgh*, by Drummond and *Old and New Edinburgh*, by Grant.

Edinburgh University took its origin from the zeal of the Reformers for education. In 1583 the college was opened. In the 18th century it began to grow. The beginning of a medical college was made in 1724, and in the latter part of the century the fame of the university was greatly increased by the reputation of several of its professors, and since then it has become one of the greatest universities in Great Britain. A students' representative council was founded in 1884, as a means of expressing the opinion of the students on university matters. Goldsmith, Scott, Carlyle and Darwin are among the eminent students of the university, and many learned men have been professors there. There are four departments, that of arts, of divinity, of law and of medicine. The university-library contains 150,000 volumes, and there are several smaller libraries besides. It has 133 professors and 3,200 students. The university also has a natural-history museum, an anatomical museum and a botanical museum. There are a large number of scholarships and fellowships.

Edison, Thomas Alva. To no other man who ever lived does the term "born inventor" apply so aptly as to the "Wizard of Menlo Park." Watt and Morse achieved invention by years of patient scientific investigation; Arkwright and Whitney had invention thrust upon them by circumstances; Fulton was an inventor by natural gift, but followed the profession of an artist up to the age of 40. But Edison lived and breathed in the atmosphere of creation from early boyhood, jeopardized his scant living for the pure joy of doing his own work, and was known as the boy-wonder in electricity on Wall Street, New York, soon after he cast his first ballot. It has been said of him that he "kept the path to the patent-office hot with his foot-steps."

THOMAS ALVA EDISON

The thing that impresses the reader of a life of Edison, first and last, is its joyousness. From babyhood he was the busiest, happiest, most intensely interested in life of any boy in the village of Milan, Ohio, where he was born on February 11, 1847. His father made shingles by hand, and Alva, as he was then called, haunted the shop. But he found the docks along the canal more dramatic, for sometimes as many as five hundred wagon-loads of wheat and corn would be brought in by farmers in one day and loaded on the grain-boats. He watched everything with his big gray eyes, and was not slow about asking questions. A sturdy little "sobersides," his mother called him, too busy to play much with other boys. At home he was a voracious reader, and when the family moved to Port Huron, Michigan, he set himself seriously to work to reading all the books in the public library, a task he wisely abandoned. At 12 he became a business man, and had marked success as a train boy. He sold more newspapers, books and fruit than the other boys, and still had time to print a little newspaper and start a laboratory in one end of the smoking-car. In saving the life of a station-agent's baby he won a friend who taught him the trade of telegraph-operator. He soon became skilful in sending and taking messages, but he had to know how the instrument worked and why, and experimented with an old battery in his father's cellar until he understood it.

At 15 Edison was in charge of the station at Stratford, Canada, where he was so busy doing his own work that he very nearly caused a wreck on the road and won his discharge. It must be said that he never worked well under orders. He lost positions by his inattention to duty almost as fast as he gained them by ability. His first invention was of a repeater, that would take down the dots and dashes as they came rushing over the wire, and repeat them as slowly as necessary for the operator to write out at his leisure. Then he began to experiment on the problem of sending more than one message at a time over the same wire. He dressed shabbily, and spent all he earned on books and apparatus. He was thought to be an impractical, dreamy fellow, and his employers were often impatient. Thus for five years he led a wandering life, often out of work that would bring in money, but working hard on his own ideas and leading a clean, straight life of the intellect. Pleasures never tempted him. His idea of fun was to be so absorbed that he didn't know if it were night or day. "I owe my success," he has often said, "to the fact that I never had a clock in my workroom."

At 21 Edison went to Boston, a rapid operator. In another year he was in New York, when accident led him to repairing a ticker in a broker's office and to a salary of $300 a month. Then he invented an improved apparatus for which he got $40,000. The Western Union took an option on his future inventions, and the young genius started a factory in Newark, New Jersey, with 300 employes. It was the most remarkable establishment in the world, where everybody worked from sheer enthusiasm, with irregular hours and no book-keeper. But Edison literally coined his inventive brain into money. He had 50 inventions at various stages at one time, wired instructions to his patent-attorney every day, and cabled applications for patents to London. Before he was 30 the factory was sold, and Edison built the laboratory at Menlo Park to devote his time entirely to invention. There he worked out the problems of the telephone, the incandescent electric light, the phonograph and other great discoveries

Ah, what a workshop that was! One hundred feet long it was, with a maze of wheels and flying belts, lathes, drills, planers and milling-machines.

HIS METHOD OF WORKING.

Above were a chemical laboratory and a library; and skilled workmen and scholarly experimenters, a private secretary and even a book-keeper. A big workshop and a small house suited Edison exactly. He went about in shabby work-clothes and acid-stained hands. Most of the time his wife and children dined alone, for the Wizard was never to be disturbed. He ate when he was hungry and rested when he was tired and had as much fun in his work as a boy at a ball game.

Not all of his inventions were made easily. Some he worked on for years and spent thousands of dollars in perfecting. One rule he has always kept: "Be sure a thing is needed or wanted, then go ahead." The phonograph, telephone transmitter, electric light and power system, megaphone, quadruplex, tasimeter for measuring the heat of the stars, kinetoscope, anyone of a dozen big inventions would have won fame for the man, but they are not usually identified as belonging to him in the multitude that bear his name. The electric light made him rich, but cost him years and vast expense to perfect. Men were sent around the world to find material for the filament.

THE FIRST ELECTRIC LIGHT.

It was in 1880 that Menlo Park was first illuminated with the electric light. Special trains were run out for the event from New York City, and there was as much excitement as when the first steamboat was launched on the Hudson. In 1886 Menlo Park was outgrown, and an immense plant built at Orange, New Jersey. Wealth and fame, however, have not brought leisure to the inventor. His highest pleasure is his work, and he gives the world his best in his inventions, he says: So why should he give his society? But the world insists that the best of any man always is himself, and is disappointed that Edison continues to seclude himself in his shop. The few who are privileged to know him testify to his personal charm. He is philosophical, enthusiastic, cheerful; loves a good story or a joke; enjoys music and books and children, and takes occasional trips abroad with his family. He apparently knows as little what time of life it is with him, as what time of day. Life has not lost its zest nor work its charm.

Edmonton, the capital of Alberta, population 16,000, on the Saskatchewan River, is 180 miles north of Calgary. Valuable coal-fields surround it. The trade of the great Mackenzie basin is attracted to it. It is the center of an immense and rich agricultural tract, and was an important point in connection with the fur-trade. In early days it was a point of departure on the Edmonton route for the Klondike. A railway-center, served alike by the Canadian Northern, the Canadian Pacific and the Grand Trunk Pacific, Edmonton is growing rapidly and promises to be a considerable city.

Ed'mund, for his bravery surnamed Ironside, king of England for seven months in 1016, was son of Ethelred the Unready and half-brother of Edward the Confessor. He is said to have been born in 989. He was chosen king by the Londoners, while Canute was chosen by the *witan* or council. Edmund entered the struggle with great energy. He gathered an army and defeated Canute in two hard-fought battles. He then raised the siege of London, and again was defeated in Essex, and this forced him to agree with Canute to a division of the kingdom, Canute taking the north side, while Edmund took the south. It also was agreed that, in case one of the kings should die, the other should become king of the whole of England. A few weeks after this agreement Edmund was murdered in 1016.

Edmunds, George Franklin, an American statesman, was born at Richmond, Vermont, Feb. 1, 1828. He was admitted to the bar in 1849, and sat in the state legislature from 1854 to 1859 and in the state senate from 1861 to 1862. In 1866 he was elected to the senate of the United States, where he served on many important committees, and was president *pro tempore*

GEORGE P. EDMUNDS

after Mr. Arthur became president. He took an active part in the prosecution of President Johnson, and was one of the electoral commissioners appointed in 1877 to decide upon questions connected with the counting of the electoral vote of the disputed presidential election of the previous year. He was the author of the acts of 1882 and 1887 for the suppression of polygamy in Utah. In 1891 he withdrew from political life. He was noted for legal knowledge. He died in 1919.

E'dom or Idumea, a name given to the whole country extending from the Dead Sea southward to the Gulf of Akabah. It was about 100 miles long from north to south. The mountains are steep, bare masses of chalk and porphyry. The Edomites were recognized by the Israelites as a closely connected race, being the descendants of Esau, the brother of Jacob. Their religion was a belief in many gods. They were conquered by Saul and subdued by David, and were subject to Judah until the reign of Joram. They regained independence under Ahaz, and after the fall of Judah became masters of southern Palestine and Hebron, but were completely subdued about 126 B C. From that time the western part (Idumea) was held by Jewish governors, one of whom, Antipater, became procurator of all Judæa in 47 B. C. His son, Herod the Great, founded the last Jewish dynasty. After the destruction of Jerusalem (70 A. D.) the country was merged in Arabia Petræa, and the name of Idumea disappears from history. See *The Desert of the Exodus* by Palmer.

Education, History of. A liberal professional preparation for teaching is hardly possible without a comparative study of educational progress as shown in past and present educational systems. It may take either of two general forms: that of education as a whole or that of formal pedagogy in particular. If the former, the field includes a history of the growth of all branches of learning and of the various institutions of civilization in general; if the latter, it is limited to the development of educational doctrine and the growth of systems and methods. There are commonly recognized five great epochs in educational history: the Oriental, the Classical, Christian before the Reformation, the Reformation and the Modern Epoch. Each epoch is rich in instructive material, throwing light upon nearly every problem which the teacher meets and helping him to a more comprehensive view of the methods by which they may be solved.

The following are among the most commonly used texts on this subject: Compayre, Painter, Seeley and Williams. See also Boone's *Education in the United States*, Swett's *American Public Schools*, Klem's *European Schools*, Quick's *Educational Reformers*, Laurie's *Rise and Early Constitution of Universities*, Lang's *Great Teachers of Four Centuries* and the histories of education in the different states of the Union, published by the bureau of education. Among these texts one of the oldest and perhaps the most interesting is Quick's *Educational Reformers*. A more recent and comprehensive work is Paul Monroe's *History of Education*. This is a volume of nearly 800 pages, and is an extremely valuable work. The substance of this is now available, also, in a volume of a little over half the size, suitable for beginning students. The title is *A Brief Course in the History of Education*

Education, Modern. Perhaps no phase of social activity has undergone so radical a development in modern times as that of education. This evolution may be outlined under the headings of aim, subject-matter, method and organization of education. In regard to aim, four points may be noted. First: The ideal has come to be more and more progressive. Education no longer regards itself as confined to the task of fitting the child to live contentedly the life of the parent, but consciously labors to inspire the young to strive for better conditions and to prepare them to attain these. Second: Education no longer, as in ancient times, aims to train the individual merely in the interest of society nor, as in medieval and comparatively modern times, for individual culture or development, but rather for what may be called social efficiency. Third: Such an aim includes not only the religious, ethical and cultural training toward which attention was formerly almost solely directed in the education of the school, but vocational training, whether along professional or industrial lines, and such political training as fits for citizenship in those advanced nations where self-government prevails. Fourth: All this involves the extension of education to all classes, so that no general phase of culture is peculiar to any social order.

The subject of education has been affected by all of these modifications in aim. Science, history and modern literature have been added to mathematics, theology and the classics. In general the curriculum has been enriched by subjects giving interesting or valuable subject-matter, and the disciplinary subjects have been reduced in importance. The elementary school has developed geography, nature study, literature, manual training and art in addition to the three "Rs." The subject-matter of the various vocations, from engineering to medicine, has been organized and taught.

In method the most important reform is due to the growth of the now well-established belief that mastery of method is quite as important to the teacher as knowledge of subject-matter. Psychology has

been appealed to as a source from which correct method should be derived. In general, mechanical memory-work has been replaced by such as appeals to reason and stirs interest and spontaneity. The inductive method, involving the idea of development lessons (see METHOD OF TEACHING), library-methods, laboratories, workshops, illustrations, all rouse self-activity (q.v.), excite interest (q.v.), involve the constant application of what is learned, and aid in producing a progressive, alert and adaptable rather than a mechanical and passive character. The idea of formal mental discipline (q.v.) has been discredited by psychology, and more and more abandoned for that of discipline through valuable and interesting subject-matter. The course of study has been organized to appeal more to the powers, instincts and interests of the child at various stages in his development. Finally, trained psychologists have been to some extent employed in connection with school-systems.

In organization the most marked advances of modern times have been the development of state-systems of popular education (practically the creation of the 19th century), the transfer to a large extent of education from church or private control to that of the state, the expenditure of enormously greater funds for educational purposes, the development of supervision, very close in the advanced states of Europe, professional training for teachers, the differentiation of schools according to the aim of the instruction, and the better organization and unification of national systems. In all these directions an enormous amount remains to be done.

See APPERCEPTION, CORRELATION, CHILD STUDY, INTEREST, METHOD IN TEACHING, MENTAL DISCIPLINE, PSYCHOLOGY FOR TEACHERS, SELF-ACTIVITY and SCHOOLS, ELEMENTARY. Consult *Text-Book in the History of Education*. Monroe.

Education, State-Aid in. In the United States, education is one of the matters which falls within the control of the several states, and not of the Federal government. The result of the power lodged in the states is that they tend to give aid in money and land to the schools; while, in return, their control over the schools increases, and the educational system in this way becomes more uniform. Thirty of the states make the education of children compulsory for an average term of five years. Most cities have their own superintendents of public instruction, and their own school-systems under a charter from the state. Each state, however, has a superintendent of public instruction who is given this title in 29 of the states, other titles in others. One of the benefits of state-control in education is that the more prosperous sections help to improve the schools of less prosperous places. The state generally supports normal schools for the training of teachers. In the west and south the states go so far as to support universities, which is done nowhere else in the world to anything like the same extent. Secondary education often receives special attention from the state. Massachusetts requires the townships to maintain secondary schools. The University of the State of New York, however, is the best example of how the state may organize secondary education. The regents examine the high-schools, and allot vast sums in their aid. In Indiana, Minnesota and other western states the state-board of education accredits high-schools, which may then send their graduates direct to the state-university without examination. Each state admitted to the Union since 1800 has ceded land for a state-university and for common-schools. In 1836 many of the states distributed the surplus revenue that was returned to them by Congress wholly or partly among the schools. Of the land-grants for education made by the states, the chief is the 16th section of each township and, in states admitted since 1848, the 36th section also. In all, the states have granted about 68,000,000 acres of land; and to this they have added vast grants also in money.

Ed'ward, surnamed the Confessor, the last Anglo-Saxon king of the old royal line, was the elder son of Ethelred the Unready. On the deaths of Ethelred and Edmund Ironside, in 1016, Canute obtained possession of the throne and married the wife of Ethelred. Until Canute's death, in 1035, Edward lived in Normandy, but in 1042 he succeeded his half-brother, Hardicanute, as king. He was continually under the influence of favorites, who usually were foreigners; and the history of his reign is a record of the struggle between the Norman or court party and the old Anglo-Saxon party under Earl Godwin and his son Harold. Edward also carried on wars with the Welsh. He died on Jan. 5, 1066. He was canonized in 1161 by Pope Alexander III. With him the old English monarchy perished, save for the few months of the energetic rule of his successor, Harold II.

Edward I, king of England, the elder of the two sons of Henry III, was born at Westminster, June 17, 1239. At the parliament of Oxford (1258) he took part with his father in his contest with the nobles, but later seems to have sided with Earl Simon de Montfort, the leader of the barons or national party, but soon joined his father again. It was his rash eagerness which lost the battle of Lewes (1264), in consequence of which he was imprisoned as a hostage for his father's pledges. He made his escape soon after and gained the battle of Evesham (1265), which ended the great struggle between the king and the barons

by the death of Earl Simon on the field. In 1270 Edward set out on a crusade, and two years later barely saved himself by his great strength from being murdered by one of the infamous sect of the Assassins. While he was still absent, his father died, and Edward was proclaimed king, but did not reach England till nearly two years after. He at once began that policy of reform which has given him the name of the English Justinian, and made his reign almost the most important period in the constitutional history of England. His first war was with the Welsh, and ended in the complete subduing of that nation at the defeat and death of Prince Llewellyn and the execution of Prince David as a traitor in 1283. In 1290 he banished all the Jews from the kingdom, to the number of over 16,000, on the charge of excessive usury. About the same time the contest for the Scottish crown gave Edward a chance to assert the old claim of the English crown to the over-lordship of Scotland. He decided the contest in favor of John Balliol, who swore homage to him for the whole of Scotland. Meanwhile a war with France was threatening, and Edward called together an assembly which was practically the beginning of the modern English parliament. Balliol soon found his position as a vassal-king intolerable, and open war broke out in 1296. Edward marched north, forced Balliol to surrender, and subdued the kingdom in five months. Then he sailed to Flanders to carry on the French war; but, in order to make peace with his nobles at home, he confirmed the Great Charter and added other clauses, thus finally establishing the right of the people themselves to determine their own taxation. As a landmark in the history of England, this is second only to *Magna Charta* itself. Affairs in Scotland soon compelled his return from Flanders. Wallace had collected a large force, and completely defeated an English army at Stirling (1297). Edward, however, defeated Wallace at Falkirk, and afterwards (1305) executed him as a traitor. He then prepared a new constitution for the conquered kingdom, and made arrangements for the representation of the Scots in the English parliament, a measure which, had it been successful, would have joined England and Scotland together four centuries before the union took place. But, before long, Robert Bruce raised a revolt, murdered the regent, Comyn, and was crowned king (1306). Edward at once set out against him, but died on the way, in July, 1307, at Burgh-on-Sands, near Carlisle, leaving his son Edward the command not to bury his body till he had utterly conquered the Scots. The people loved him dearly. See *The Early Plantagenets*, by Stubbs, in *Epochs of Modern History*.

Edward II, son of the preceding, was born in Wales, April 25, 1284, and created Prince of Wales in 1301, being the first heir to the English throne who bore that title. He accompanied his father on his last expedition to Scotland, but, instead of carrying out his dying command, he returned to London and gave himself up to pleasure. He came to the throne in 1307, but always was under the influence of favorites. The first of these was a Gascon, Piers de Gaveston, whom he left as guardian of the kingdom while he went to France to marry Isabella, the daughter of Philip V. The nobles demanded the banishment of Gaveston, and twice he was forced to leave the kingdom, being finally executed by the nobles in 1312. Two years later Edward invaded Scotland at the head of 100,000 men, but suffered a terrible defeat by Robert Bruce at Bannockburn, which secured the independence of Scotland. In 1321, with the aid of his new favorite, Hugh le Despenser, and his son, Edward overthrew and put to death his minister, Lancaster, who had controlled him for some years. He then sent Isabella, his wife, to France to treat with her brother, the French king, about a quarrel which had arisen between the two countries. Isabella despised her husband and hated the Despensers, and so joined several of the discontented nobles in a conspiracy against Edward. She landed in Suffolk with a force in September, 1326, captured the king and cast him into prison. The Despensers were executed, and Edward was compelled to resign the crown. He was murdered at Berkeley Castle a few months later, in 1327.

Edward III, son of the preceding, was born at Windsor in 1312, and was crowned king, Jan. 29, 1327. During his childhood the country was governed nominally by a council of nobles, but really by Roger Mortimer and Queen Isabella. In 1330 Edward seized Mortimer and put him to death, and sent away his unworthy mother. He then invaded Scotland to help Edward Balliol, son of John Balliol, who had secured the crown. He defeated the Scots at Halidon Hill (1333), and made Balliol do homage to him. As a warrior, Edward's greatest exploits were in France. He laid claim to the French throne and made war on Philip VI. This was the beginning of the Hundred Years' War. His claim, through his mother, a sister of Charles IV, was groundless; but, nevertheless, he carried on the contest with great vigor. He laid heavy taxes on the people in order to raise money for the war, and was obliged to grant many valuable privileges, especially to the nobles. Accompanied by his eldest son, called the Black Prince, he conquered a great part of Normandy and gave the French a terrible defeat at the famous

battle of Crécy (1346), where the Black Prince, though but 16, showed the greatest courage. The city of Calais was taken after a siege of 12 months, and the six burgesses who offered themselves to the king, as a sacrifice for the safety of the rest of the citizens, were saved from the king's wrath only by the entreaty of the good Queen Philippa. Meanwhile the Scots had been severely defeated at Neville's Cross (1346) and their king, David II, taken prisoner; while in 1349 the Black Death had carried off a third of the population of England and permanently changed the relations between master and laborer. After a long truce the French war began again in 1355, and next year the Black Prince won the victory of Poictiers, where the French king, John, was captured. The Black Prince was given Aquitaine and Gascony by his father, and before long got himself and King Edward into another war with France, which was disastrous to England. In spite of all his brilliant victories and the bravery of his son, Edward was unsuccessful in his wars. Affairs at home were in a bad condition; he quarreled with his parliaments, gave himself up to the influence of his mistress, and let his government slip into the hands of his third son, John of Gaunt. The Black Prince, who had headed a party opposed to his father, died in 1376, and the following year the king himself died, after a reign of over 50 years. See *Edward III*, by Warburton, in *Epochs of Modern History*.

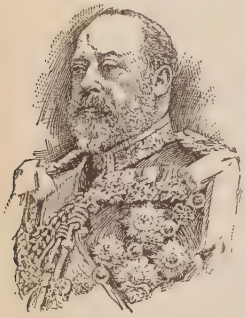
Edward IV, son of Richard, duke of York, was born at Rouen in 1441. It was the period of the struggles between the two great houses of York and Lancaster. Upon the death of his father at the battle of Wakefield in 1460, Edward found himself at the head of the Yorkist party. He soon gained the battle of Mortimer's Cross, and, though the Earl of Warwick a few days later lost him the second battle of St. Albans, he entered London in triumph and was hailed as king. Soon after, he gained the great battle of Towton, which seated him on the throne (1461). Margaret, the queen of Henry VI, kept up the struggle in the north, but the capture of the weak and unhappy Henry VI put an end to her hopes. Edward quickly became popular because of his frank manners and handsome figure; but his marriage with Elizabeth Grey, daughter of the Lancastrian, Lord Rivers, and the raising of her relations to power displeased the Earl of Warwick, who was the king's most powerful minister. Warwick entered ino a conspiracy against him and tried to bring back the Lancaster party to power, but was defeated and killed in the battle at Barnet in 1471; and the war was ended by the defeat of Queen Margaret at the battle of Tewkesbury. Edward showed the cruelty of his nature by the murder of Margaret's young son after the battle and the severity of his vengeance on other captives. (The murder is now credited to Richard, afterward Richard III). The death, in the Tower of London, of the old king, Henry VI, made Edward feel secure on the throne. He practically stopped the calling of parliaments, and got the money he needed by taking forced loans from wealthy men and by carrying on trade by means of his merchant-vessels. He died in 1483, worn out by his evil life. See *Houses of Lancaster and York*, by Dr. James Gairdner, in *Epochs of Modern History*, and Green's *History of the English People*.

Edward V, son of the preceding, was born in 1470. At the death of his father he was a boy of 13. His uncle, Richard of Gloucester, managed to get himself appointed protector of the kingdom, and shut up the young Edward and his little brother in the Tower. They were never heard of again, but there is much doubt that they were murdered by the order of their uncle, who had himself crowned king in the same year. (Later historians charge Henry VII with these murders). Nearly 200 years later some bones were found in an old chest and, being supposed to be the remains of the unfortunate princes, were buried in Westminster Abbey.

Edward VI, born on Oct. 12, 1537, was the son of Henry VIII, by his third queen, Jane Seymour. He was taught by such learned men as Roger Ascham, and in January, 1547, he succeeded his father as king, his uncle, afterward Duke of Somerset, having been made protector. Somerset invaded Scotland to try to compel the marriage of Edward and Mary, Queen of Scots. He gained the battle of Pinkie, but had to return home because of the intrigues of his brother, Earl Seymour, whom he executed. Two rebellions, one of the Catholics and the other of discontented laborers, were put down; but by the intrigues of Dudley, Earl of Warwick, Somerset was accused of treason and beheaded. Dudley (now become Duke of Northumberland) then married his son to Lady Jane Grey and induced Edward, who was dying, to make her his successor on the throne. The king lived only a short time after, dying in July, 1553, as some thought, of poison. Under Edward the Catholics were greatly persecuted by the Protestant leaders. See *Literary Remains of Edward VI*, by J. G. Nichols.

Edward VII, king of Great Britain and Ireland and Emperor of India (long known as Albert Edward, Prince of Wales), was born on Nov. 9, 1841, at Buckingham Palace, London, the eldest son of the late Queen Victoria, whom he succeeded on the throne, Jan. 22, 1901. In 1863 he married Princess Alexandra of Denmark, eldest daughter of King Christian IX, and before his ac-

cession he was continually before the British public as the most active member of the English royal family, figuring at innumerable court and civic functions at home and abroad, besides visiting foreign countries and in numberless ways doing unwearied work in his high station for the crown and the nation. Among all ranks of the British people Edward VII was a favorite, and after his accession to the throne his course was marked by tact and judgment as well as by conscientious principle, as king and ruler. King Edward was uncle to Emperor William of Germany and to the present Emperor of Russia and also brother-in-law of the King of Greece.



EDWARD VII

He was crowned on Aug. 9, 1902. His living children are George, who was Prince of Wales and is now King George V, who in 1893 married Victoria Mary, daughter of the Duke of Teck; Louise, Princess Royal, who in 1899 married the Duke of Fife; Princess Victoria Alexandra; and Princess Maude Charlotte, who in 1896 married Prince Karl of Denmark, now King Haakon VII of Norway. His only living brother is Prince Arthur, Duke of Connaught; while his sisters are Princess Helena, Princess Louise and Princess Beatrice. He died May 6, 1910.

Edward the Black Prince. See EDWARD III.

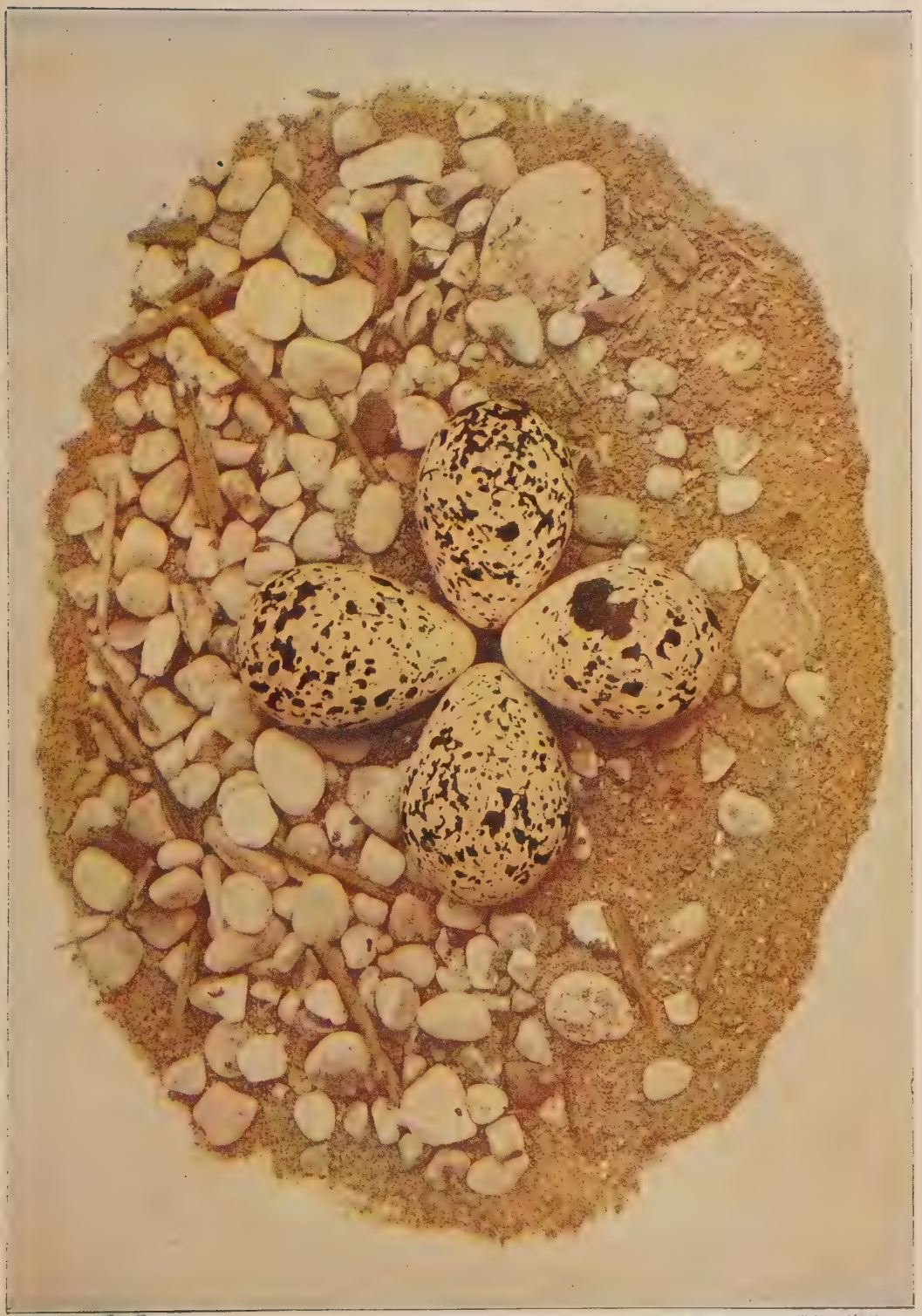
Edwards, Amelia Blandford, English novelist and Egyptologist, was born at London in 1831, and died in Somersetshire, April 15, 1892. In the fifties she began to write fiction, her principal novels being *My Brother's Wife, Hand and Glove, Barbara's History, Half a Million of Money, Denham's Vow, Lord Brackenbury* and *In the Days of My Youth.* Later in life she traveled extensively, and took a great interest in Egyptian exploration. The fruit of these activities appeared in the following books: a work dealing with the Tyrol, entitled *Untrodden Peaks and Unfrequented Valleys;* an account of some discoveries in the Nile valley, entitled *A Thousand Miles Up the Nile;* and a work on Egyptian archæology and history, entitled *Pharaohs, Fellahin and Explorers* (1891).

Edwards, Jonathan, theologian and philosopher, was born at East Windsor, Conn., Oct. 5, 1703. He early showed a decided taste for learning, and graduated at Yale College in 1720. After acting as a tutor at Yale for a few years, he was ordained to the ministry at Northampton, Mass., where he remained for many years. A dispute with his church led to his resignation in 1750. He next labored some years as a missionary to the Housatonic Indians, at Stockbridge, Massachusetts, until 1758, when he was called to succeed his son-in-law, President Burr, as president of Princeton College, but died of smallpox a month later, March 22, 1758. He has been justly styled the prose Dante of America. Edwards is still America's most original thinker in philosophy, and it is not likely that his treatise on the *Freedom of the Will* will ever be set aside He was a rigid Calvinist in theology, and his character was one of rare goodness. His description of Sarah Pierrepont, whom he married, is exquisite in spirit, and is a gem of literature. His influence on the thought of New England was large, and many of the greatest American thinkers of the generation which followed him were his pupils. See *Life*, by S. Edwards Dwight; and *Life*, by A. V. G. Allen.

Eel, a bony fish of elongated snake-like form. The eels are found in nearly all waters, both fresh and salt. In the United States they are in all streams of the eastern slope of the continent that connect with salt water. The young ones ascend streams, while the old ones descend the rivers at the breeding-period to lay their eggs on the mud-flats at the mouths of the streams. The discovery of their eggs is recent. In ascending streams they swim through rapids and over dams, but are stopped by large falls and, therefore, there originally were no eels in the Great Lakes above Niagara. They also were lacking in the streams of the Pacific slope. They have no ventral fins, but are powerful and rapid swimmers. They eat fishes, shrimps, crayfish, etc., overturning stones and thrusting their sharp noses into holes and nooks in search of food. They also lie beneath logs or in the mud, and dart out at their victims. They are active at night. They are eaten as food by many people. The common fresh-water eel attains a length of three feet; the conger-eel reaches six feet and more in length. It does not ascend streams like the others. The electric eel is another type.

Eg'bert, king of Wessex, ascended the throne of that country in 802. England at that time was divided into the three kingdoms of Northumbria, Mercia and Wessex. After a struggle with the Mercians, Egbert was recognized as overlord of that kingdom, and not long after Northumbria also accepted him as its overlord. Thus he became the first real king of England, although he did not formally assume that title, and continued to govern Mercia by means of its own king. He died in 837.

Egg, the starting-point of all animal life except the single-celled animals. The latter



FROM COL. CHI. ACAD. SCIENCES

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NEST AND EGGS OF KILLDEER

Life-size.

are produced by division of the body into two similar cells. Eggs begin with the sponges, and occur in all animals above them. The egg is formed within the ovary or egg-producing organ, and in reality is, a modified cell (see CELL-DOCTRINE) of the ovary. The size of eggs depends on the quantity of food-yolk; for example, the hen's egg is large, because there is much food-yolk in it; frog's and toad's eggs are smaller; and eggs of the starfish are smaller still. The egg is fertilized, and thereafter undergoes development. Insects lay eggs on plant-stems, leaves, bark and other places. Crabs carry their eggs attached to their bodies, spiders lay eggs in cocoons, snails and other mollusks in cases. Many worms lay eggs in capsules. Fishes lay a prodigious number of eggs; for example, a single white-fish will lay upward of 50,000. Frog's eggs are held together in a mass by a jelly-like substance. Toad's eggs are laid in strings. The eggs of snakes, turtles and alligators are laid singly and are surrounded by a leathery shell. They are usually left to be hatched by the heat of the sun. The lowest mammals, like the duck-moles of Australia, are egg-layers. In all the higher mammals the eggs, when undergoing development, are retained within the body. They are very small, because, as the nourishment is supplied by the parent, there is no need of food-yolk. Bird's eggs are of interest to collectors. The largest eggs of living birds are those of the ostrich, which are about six inches in their longest diameter, but there are preserved in museums of Europe some eggs of a gigantic extinct bird of Madagascar, which measured nearly three feet in largest circumference and would hold about two gallons. The wisdom of nature is shown in adapting the shape of the eggs of certain birds to the kind and place of the nest. In case of birds which lay their eggs on bare rocks or ground with little or no attempt at building a nest, the eggs are generally large and round at one end and pointed at the other; they are thus turned around by the wind and not blown away as would be the case if they were of more regular oval shape. Similar adaptation is found in the colors of eggs. The whippoorwill's eggs are laid on a bed of leaves with no nest and are in color much like the leaves and so are not readily seen, and so of the eggs of other birds which are laid in exposed places. A collection of birds' eggs with their great variety of sizes and shapes and the delicate beauty of their colorings is very attractive and interesting. To have value such collections must be made intelligently. The collector should know and record the name of the bird from whose nest an egg is taken; should note where the nest is placed, whether on the ground, or, if in a tree, whether in a hole or on a limb or a swinging branch. Never rob a nest; take not more than one or at most two eggs from one nest. For descriptions of birds' eggs see Davie: *Nests and Eggs of North American Birds;* Bendire: *Life-Histories of North American Birds* (in Smithsonian Contributions to Knowledge) See, also, DEVELOPMENT.

Egg-Apparatus (in plants). A group of three cells, one of which is the egg, which develops in the embryo-sac of *Angiosperms.* See EMBRYO-SAC.

Eggleston, Edward, an American author, was born at Vevay, Ind., in 1837, and joined the Methodist ministry while quite a young man. He preached for several years in Minnesota, but in 1866 took to journalism. In 1870 he went to New York, and became editor of *The Independent* and later of *Hearth and Home.* His success as a writer of stories led him to give all his time to that work. In 1871 appeared his *Hoosier Schoolmaster,* which at once gave him a wide reputation. *End of the World, Mystery of Metropolisville* and other works soon followed. In 1879 he began a series of biographies of American Indians. He was a thorough student of American history, and wrote an interesting and valuable *History of the United States.* He died on Sept. 2, 1902.

EDWARD EGGLESTON

Eginhard (*ā'gĭn-härt*) or, more correctly, **Einhard,** the biographer of Charlemagne, was born in Austrasia (a kingdom of the Merovingian Franks) about 770, and sent to Charlemagne's court, where he soon became a favorite of the emperor. He went with him on all his royal journeys, and was employed in important duties of various kinds. His *Life of Charlemagne* (*Vita Caroli Magni*) is the most important historical work of a biographical sort that has come down to us from the middle ages. It was frequently used as a schoolbook. He is supposed to have died in 840. His *Letters* are also very valuable to the student of history.

Eg'mont, Lamoral, Count of (Prince of Gâvre), was born in Hainault in 1522. After occupying many important positions in the service of the king of Spain, he was appointed governor of Flanders and Artois by Philip of Spain. He now entered into alliance with the party in the Netherlands that was opposed to the Catholic policy of Philip, and from a courtier he became at once the hero of the people. The common opinion is that he was a humane and virtuous patriot who, although he did not

care anything about Protestantism as a religion, was anxious to do justice to all the members of that body. When Margaret, duchess of Parma, was made regent of the Netherlands, he and the Prince of Orange entered the council of state and had charge of the few Spanish troops. But when insurrections took place, he broke with the Prince of Orange. He seems to have restored order, and when the Duke of Alva entered the country as lieutenant-general of the Netherlands, Egmont tried to secure his favor, though the Prince of Orange and other chiefs of the insurrection left the country. He seemed to have gained the confidence of Alva, when suddenly he and Count Hoorn were treacherously seized and carried to the citadel of Ghent. He was tried by a court, which, he claimed, had no right to try him, and along with Count Hoorn was condemned, and beheaded in the market place of Brussels, June 5, 1568. A statue now marks the place of their execution. One of the dramas of the great writer, Goethe, has Egmont for its hero. See Motley's *Rise of the Dutch Republic.*

E'gypt, a country in the northeastern part of Africa, between the Great Desert and the Red Sea. It extends from the Mediterranean to the first cataract of the Nile at Assuan. The population is over 10,000,000. Until 1915, when England declared Turkish suzerainty at an end and established a protectorate, Egypt was nominally a Turkish dependency. But since 1883, following Arabi Pasha's rebellion, Egypt had been practically ruled by Great Britain under a consul-general. His duty was to maintain order and administer affairs so that Egypt could pay her debts. England's position was defined, in the polished language of diplomacy, when her minister of foreign affairs wrote Lord Cromer, then consul-general:

> The responsibility, which for the time rests on England, obliges her to insist on the adoption of the policy which she recommends.

The chief cities include Cairo (population, 654,476), Alexandria (population, 332,246), Port Said and Suez.

The area of the subject territory, known as the Anglo-Egyptian Sudan, is about 950,000 square miles, with a population roughly computed at 2,000,000. This area extends southward from the frontier of Egypt to Uganda and the Belgian Congo, a distance of about 1,200 miles, and stretches from the Red Sea to the confines of Wadai in Central Sudan. The chief towns are Khartum (population 20,956), the capital, Omdurman (population 42 779), Halfa, Berber, Suakin, Kassala and El Obeid.

Topography. The main feature of the country is the Nile, with its course of 3,400 miles, which empties into the Mediterranean through two great mouths, its other five having long ago been filled up. The triangular space inclosed between its mouths forms the delta, now called Lower Egypt. The cultivated and settled area of Egypt is that of the Nile valley and delta, comprising 12,976 square miles. A great peculiarity of the Nile valley is the general absence of rain, the land depending on the yearly overflow from the river for the watering. In the middle of July the rise begins to appear, due to rains in the mountainous regions of the south. It reaches its highest point—an average of 35 feet at Thebes and 25 at Cairo—at the end of September, and begins to go down again in the middle of October, falling to its lowest point in April. By the end of November the irrigated land, over which the water has been evenly spread by drains and embankments, has dried and is sown; and in March the crops are ready to be reaped. The course of the river is broken by cliffs and masses of rock which form great cataracts. Over a large extent of the country the rocks are covered with moving desert-sands, and close to the Nile they are covered to a depth of about 30 feet with the soil brought down by its waters.

Agriculture. There is an entire absence of woods and forests in the Nile valley. Even clumps of trees, except the palm, are rare. The fig, pomegranate, orange, lemon, watermelon and grape are common fruits, and the most celebrated flower is the lotus or water-lily The ordinary beasts of burden are the ass and camel. Egypt is an agricultural country, and in some parts three crops in one year are raised Wheat is the chief grain; but barley, corn and clover are largely grown. Sugar-cane, cotton, indigo and tobacco are common products. The country is divided into Upper and Lower Egypt, each of these divisions being subdivided into numerous departments and there now being 15 provinces in all.

Races and Religions. The people, with the exception of 731,235 Christians, are Mohammedans. They call themselves Arabs, but probably are descended from the ancient Egyptians. The native Christians are called Copts. There also are pure-blooded Arabs, chiefly Bedouins, who live in tents in the desert, with a small number of Turks, Greeks, Armenians, Berbers and Jews. The ancient race probably was of mixed origin, partly Asiatic and partly negro.

The ancient religion of Egypt was a worship of many gods. The principal cities had each a family-group of gods, consisting of a father-god, a wife or sister and a son; these three were usually accompanied by inferior gods. But the worship of some of the groups of three was universal, and not confined to any one city, that of Osiris, Isis and Horus being found all over Egypt. Special animals were also held sacred, the most common

A SPHINX RIDDLE SOLVED

You have heard the story about the Sphinx that used to ask a certain riddle and then eat up the people who couldn't answer it. It seems the Sphinx had still another mystery in his head that he never said a word about—the temples shown in the picture. These temples were discovered by Professor G. A. Reisner, of Harvard. The Sphinx, being dedicated to the Sun, faces the East, and in his body and in his head are the temples here shown. The main temple is in the body with passages leading in various directions to other temples. The small one right in the top of his head was the holy of holies, and Prof. Reisner reached it first by digging a hole in the top of the Sphinx's head with the help of Egyptians. It was hard to get them to work for him, because they were very superstitious and didn't like to think what might happen to them if they ventured into these sacred chambers.

THE PYRAMID TOMBS OF THE PHARAOHS

In this picture you see the comparative sizes of the Sphinx and one of the great Pyramids at Gizeh. Both the Sphinx and the Pyramids were the tombs of Egyptian kings or pharaohs, and this picture takes you right into one of the Pyramids.

The bodies of the Egyptians were not only preserved in the form of mummies, but the mummies of the kings were hidden away at the end of secret passages, as you see here, so that no one would be likely to disturb them and steal the jewelry and other valuables buried with them. The connection between the blind passage and the one marked "grand passage" was closed with several great stones so arranged that when one was taken out, another would drop into its place and close up this secret passage. After the remains had been laid away and these stones put in place, the attendants went down the passage, marked "The Well," to the blind passage, and so to the outer world again.

Statue of Sepa

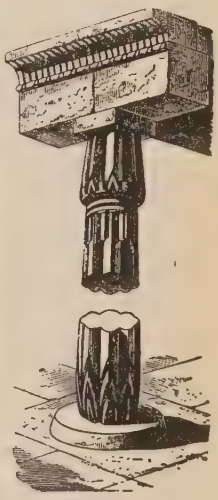
Temple of Karnak

Obelisk

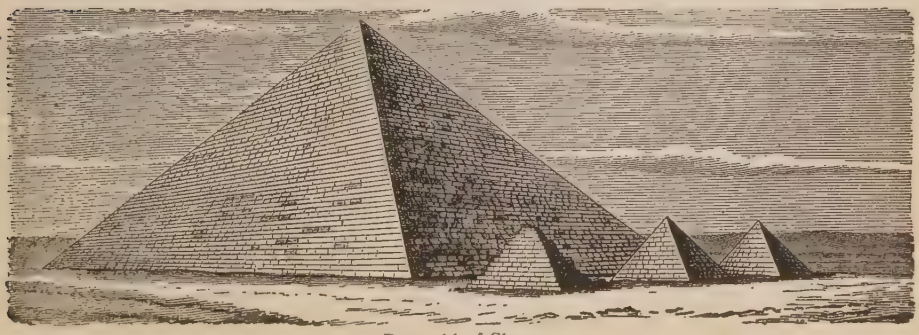
Lotus Column

Statue of Nesa

Ruins of the Temple of Luxor



Papyrus Column Karnak



Pyramid of Cheops

being the bull. The Egyptians also believed that the souls of the dead returned to the body after 3,000 or 10,000 years, and so, by embalming the bodies in spices and wrapping them in cloth, they have been preserved for centuries; many of these mummies have been found at different times. The religious buildings of the Egyptians were either temples or tombs. The great pyramids are royal tombs, having small temples in front. The temples were often covered with sculpture and paintings, and frequently were of great size. In front of them were sometimes sphinxes—figures of lions with men's or ram's heads—and also obelisks or great columns of stone.

History. When the Egyptians first became known in history, they already had a wonderful civilization. They had a knowledge of astronomy, geometry, arithmetic, the geography of their own country, etc. They had a system of picture-writing or hieroglyphics, specimens of which are found on their temples and obelisks. Their knowledge of architecture was considerable, and they evidently had a good degree of engineering skill in order to transport the enormous blocks of stone used in building temples and pyramids. They also showed great skill in sculpture, painting and music. In mechanical arts many inventions were early made, as the blowpipe, bellows, saw, chisel, balance, lever, razor, plow and other agricultural tools. A glazed pottery and a kind of glass are also found. In war, chariots came to be used, though the earlier armies were entirely foot-soldiers. Warboats also existed at an early period, and also sea-going vessels. An extensive commerce was carried on with neighboring nations.

In the 3d century B. C., Manetho, a priest, drew up a history of his country, in which he divided the early history down to the conquest of Egypt by Cambyses II (B. C. 524) into 30 dynasties, but the exact length of the dynasties is unknown. Hence the early history is usually dated simply by dynasties. The earliest point in the history we know of is the time of Menes, who is said to have made laws, begun divine worship and founded Memphis. The period of his life is placed by different authorities all the way from 5004 to 3892 B. C. Menes and his successors reigned for something like 250 years, and formed the first dynasty. The second dynasty lasted for about 300 years, but little is known of it. With the third dynasty, lasting about 200 years, the history which is drawn from the old monuments begins. One of the kings of the fourth dynasty, Cheops or Khufer, built the great pyramid at Ghizeh and rebuilt the temple of Isis near the Sphinx. About 2000 B. C. the Hyksos or shepherd-kings arose in Lower Egypt. They probably were a Tartar race, and overthrew the reigning kings, captured Memphis and established themselves in the city of Tanis. Joseph probably was the prime-minister of one of these kings, Apepi, at Tanis; and storehouses, such as he built are still to be seen at Pithom. The rulers of Upper Egypt afterward drove out the shepherd-kings. Egypt was raised to its highest point of glory by Thothmes III (B. C. 1445); all Syria and part of Mesopotamia were subject to him, and he received tribute from Assyria, Babylon, Phœnicia, Central Asia and the Ethiopian tribes of the south. A later king, Rameses II, carried on a long war with the Hittites, with whom he finally made a treaty. He was a great king, and Egypt was still in the height of her glory during his reign, which was about 1322 B. C. His son probably was the Pharaoh spoken of in the Bible, when the Israelites under Moses left Egypt. His son closed the 19th dynasty. With the 26th dynasty the history of Egypt became involved with that of Greece and Judæa. One of her kings helped Hezekiah against Sennacherib, king of the Assyrians. Necho II planned the canal across the Isthmus of Suez, but gave it up, cutting one from the Nile to the Red Sea that remained in use for centuries. He defeated Josiah, king of Judah, and conquered Palestine, but was himself defeated by Nebuchadrezzar. A later king, Amasis, was a friend of the Greek colonists in Egypt, but was conquered by Cambyses, king of the Persians, and Egypt was under Persian rule for many years. While a Persian province, Egypt was conquered by Alexander the Great, who founded Alexandria in 332 B. C. Under the succeeding Ptolemies the royal court became a center of learning and philosophy, and the great library at Alexandria was established. After the rule of the celebrated Queen Cleopatra, which ended with the battle of Actium (31 B. C.), Egypt became a Roman province. In 639 A. D. the Arabs invaded the country, and Egypt became a Mohammedan province. One of her governors made himself practically independent, and annexed Syria. Later the line of the Fatimi caliphs conquered Egypt and founded Cairo. They were deposed by the Kurd general, Saladin, who carried on the war against the European crusaders. One of Saladin's descendants introduced the bodyguard of *Mamelukes* or white slaves, who on his death usurped the supreme power (1250), and kept it for two centuries. These slave-kings were distinguished for valor, ability as rulers, luxury and encouragement of art. In 1517 their brilliant rule came to an end on the conquest of Egypt by Selim I, the Ottoman sultan.

Nearly three centuries of weak and corrupt government by Turkish governors or pashas, varied by rebellions of the Mameluke chiefs, bring us to the French invasion of Bonaparte

in 1798. He conquered the country, but the French were soon driven out by the British, and Egypt was given back to the Turks in 1801. In 1805 Mohammed Ali became pasha. He completely overthrew the Mameluke chiefs, formed a regular army and introduced the beginnings of European civilization. He annexed Nubia and part of the Sudan, and his son conquered Syria. He was succeeded by his grandson, who was superseded by Mohammed Ali's youngest son, Said Pasha. Under Said the Suez Canal was cut by the French engineer, M. de Lesseps, and was opened in 1869. Said was succeeded by his nephew, Ismail, who, a few years later, took the hereditary title of khedive, and soon after bought from Turkey the right to make treaties and maintain an army, thus making himself practically an independent ruler. He began many improvements, such as the building of roads and bridges, the constructing of railroads and telegraphs; he reformed the postal service, improved the harbors, supported education and introduced better courts of law. Through Sir Samuel Baker and Charles Gordon, ("Chinese Gordon"), his governors of the great region known as the Sudan, he suppressed the slave-trade. In order to carry out all his reforms, however, he fell very heavily into debt. Various financiers were sent from England to try to arrange a system of managing the money-matters of the government, and finally England and France were given a controlling influence in the government The khedive's unwillingness to pay the debts due European bankers led the European governments to demand his abdication, and he was deposed by the sultan of Turkey in 1879, being succeeded by his eldest son, Tewfik. A law for the management of the public debt was passed in 1880. Next year Arabi Pasha became minister of war, and finally openly opposed the khedive and European interference, being strongly supported by the natives, who disliked the Europeans. British and French warships were sent to Alexandria in 1882, but the French ships sailed away and the attack was made by the British alone. Arabi withdrew from the city, but large numbers of European citizens were killed by the natives before a force could land to enforce order in the city. Meanwhile Sir Garnet (later Lord) Wolseley was sent out with more troops from England and completely defeated Arabi's army at Tel-el-Kebir. Arabi was banished to Ceylon. Since then England has had a controlling influence in the government. In 1882 began the great rebellion in the Sudan. That region had been governed as a province of Egypt; but Mohammed Ahmed, calling himself the Mahdi (a kind of Mohammedan Messiah), put himself forward to free the Mohammedan faith from its enemies. He captured El Obeid, and completely destroyed an army sent against him under the command of an English officer, Hicks Pasha (1883). His influence spread rapidly, and he gained other important victories. Meanwhile General Gordon was sent out from England to secure the withdrawal of the Egyptian garrisons from the Sudan, Egypt having agreed, by England's advice, to give up most of her possessions in the Sudan. Gordon kept his position at Khartum against the Mahdi, but found he could not get the garrisons away without reënforcements. Unfortunately, England delayed too long in sending the reënforcing expedition, which approached Khartum only to find that it had been taken and Gordon killed two days before (Jan. 26, 1885). The expedition withdrew, and left the Sudan to its native tribes and the Mahdi. Since then the Mahdi has died; but the affairs of the Sudan have, under British energies, taken on an entirely new and greatly improved aspect. This is in large measure due to the valor of General Sir H. H. (later Lord) Kitchener, who in 1892 was made Egyptian Sirdar, and in 1896 was commander-in-chief of an expeditionary force, composed chiefly of Egyptian and Sudanese troops under British officers, who undertook at the order of the English government to reconquer the Sudan. Since the fall of Khartum the English had held the rebellious dervishes at bay at Wady Halfa, as far as the Egyptian frontier then extended. In May, 1896, a brigade of Indian troops was brought from Bombay to Suakim and joined the Sirdar's expedition, which now advanced. By September, Dongola, after sharp fighting, was occupied. The next year, Abu-Hamed and Berber fell before the Anglo-Egyptian onslaught; while in 1898 a dervish-army of 16,000 men, after severe fighting, was worsted on the Atbara, and the khalifa's entire force of 50,000 men was later in the year totally defeated at Omdurman and the city occupied by Kitchener and his gallant force. The dervish slaughter was terrible; but it had its result in the successful reconquest of the Sudan.

Finances and Education. Since 1882 an English army of occupation has remained in Egypt. To meet its cost (the present strength is 6,063) the Egyptian government annually contributes $750,000. The Egyptian revenue, the chief sources of which are the land-tax, the tobacco-monopoly and the customs, amounted in 1911 to over $77,000,000, and the expenditures exceeded $75,000,000. The value of the imports for 1911 was £E27,227,118, and of the exports £E28,598,991. The number of government vernacular schools (primary, technical and special) was 163 in 1911, with a teaching-staff of 900 and an attendance of 27,454 pupils, 6,000 of whom were females.

Communications. In the Delta Region trade and travel are chiefly by rail; in the Upper Nile region, by rail and water. The first railroad, that from Cairo to Alexandria, was begun in 1852. Both cities are now connected with Suez and all important towns in the Delta by branch lines. As in the case of waterways in other countries, the Nile is largely used for the transportation of goods where speed in delivery is not an important consideration. Above Assuan it is the only means of communication, and a trip on the Upper Nile is one of the picturesque features of "doing Egypt." Caravan routes connect the Nile with the oases to the west and with the Red Sea.

See PYRAMIDS, CAIRO, ALEXANDRIA, SUDAN, GORDON. See Sir Gardner Wilkinson's *Manners and Customs of the Ancient Egyptians;* A. B. Edwards: *A Thousand Miles up the Nile;* S. Lane-Poole: *Egypt;* and Baedeker's *Egypt.*

Ehrenbreitstein (*ā-ren-brīt'stīn*), a town and fortress of Rhenish Prussia. It is situated on the right bank of the Rhine, opposite Coblenz, with which it is connected by a bridge of boats and an iron railroad-viaduct. The fortress is on a high, rocky summit, 387 feet above the river, and is very strong. It was begun in 1672, and was captured by the French in 1799, who blew up the works two years later. It was turned over to Prussia by the Congress of Vienna in 1815, and was soon again fortified. Population of the town 5,299.

Eiffel (*ī'fĕl*), **Gustave,** a French engineer, was born in 1832. He engaged in many important works of engineering, as the construction of the bridge over the Douro at Oporto, the design of the great locks intended for the French Panama Canal and the building of the iron framework of Bartholdi's statue of Liberty. But the work with which his name is most prominently associated is the famous Eiffel Tower on the *Champ-de-Mars,* in Paris, which was completed on March 31, 1889. It comprises three stories, reached by a series of elevators, the platform at the top being 985 feet above the ground. A little less than 7,000 tons of iron were used in building it. The cost was about $1,000,000, of which $300,000 were voted by the government, the rest being supplied by M. Eiffel, who expects to recoup himself by the admission-fees during the 20 years for which they are granted to him.

Einstein, Albert, German-Swiss physicist, celebrated for his discovery and statement of the theory of relativity (*q. v.*). He was born at Ulm, Germany, in 1879, attended school in Switzerland, became a Swiss citizen, and for some years was examiner of patents at Berne. In 1909 he began to lecture at the University of Zurich, and after 1914 at Berlin. He made many important discoveries in molecular physics.

Eisenach (*ī'zen-ăk*), a town of Germany, in Saxe-Weimar, on the northwestern edge of the Thuringian forest. The castle of Wartburg stands 600 feet above the town. It was built in 1067, and was the home of St. Elizabeth and also the ten months' asylum to which Luther was borne by the elector of Saxony in 1521. It also was the birthplace of Bach, the great composer. The chapel in which Luther preached, with the room he occupied and in which he overcame the Evil One by throwing an inkstand at his head, is still pointed out The town has a population of 35,153.

Eland. See ANTELOPE.

E'lastic'ity, a general property of matter, which may be briefly but roughly defined as the resistance which a body offers to a change either of size or of shape. A more accurate definition is the already classical one of Lord Kelvin, which runs as follows: "Elasticity of matter is that property in virtue of which a body requires force to change its bulk or shape, and requires a continued application of the force to maintain the change, and springs back when the force is removed, and, if left at rest without the force, does not remain at rest except in its previous bulk and shape."

When two or more forces are applied to a body in such a way that their resultant is zero, there is no acceleration, and no evidence, therefore, from the motion of the body, that such individual forces are acting. Such forces are said to be in equilibrium. A pair of forces in equilibrium is called a stress. The change in shape or size which results from such a stress is called a strain. And the elasticity of any body is measured by the ratio of the stress to the corresponding strain. Thus:

$$\text{Elasticity} = \frac{\text{Stress}}{\text{Strain}}$$

In nature we meet practically three kinds of stresses. To each of these three stresses corresponds one kind of elasticity, each of which is included, however, in the general definition given above. We proceed to consider these three types of stresses.

I. ELASTICITY OF LENGTH

When a force is applied to a body in such a way as to alter its length, either by compressing it or stretching it, the force is necessarily distributed over the cross-section of the body. The longitudinal stress at any point in a body is defined as the ratio of the force to the area at that point. A longitudinal stress always produces an elongation of the body to which it is applied. The total change in length depends not only upon the stress but upon the original length of the body. Accordingly the longitudinal strain is defined as the ratio of the total elongation to the length. Now the elasticity of length for any material is measured by the ratio of the longitudinal stress to the longitudinal

strain. And hence for this ratio, which is generally known as Young's modulus, we have

$$\text{Young's Modulus} = \frac{\text{Longitudinal stress}}{\text{Longitudinal strain}}$$

If a force F, applied to a wire of cross-section a and length L, produces an elongation e, then

$$\text{Young's Modulus} = \frac{\left(\frac{F}{a}\right)}{\left(\frac{e}{L}\right)} = \frac{F\,L}{e\,a}$$

This is the equation employed by engineers in computing the proper cross-section of the ties in a bridge.

II. ELASTICITY OF VOLUME

Let us denote the volume of a body by V. Imagine the volume to be subjected to pressure, so that it is diminished by an amount v. The ratio of the diminution to the total volume is called the voluminal strain. Suppose further that this change of volume has been produced by applying a force F to a surface of area a; as, for instance, when air is compressed in an ordinary bicycle-pump. The ratio of the total force to the area over which it is applied is the voluminal stress; and is what we call pressure. In accordance with our general equation, the elasticity of volume for any material is measured by the ratio of the voluminal stress to the voluminal strain. This ratio is generally known as the bulk modulus, and is commonly denoted by k.

$$\text{Bulk Modulus} = k = \frac{\text{Voluminal stress}}{\text{Voluminal strain}}$$

$$k = \frac{\left(\frac{v}{a}\right)}{\left(\frac{v}{V}\right)} = \frac{F\,V}{a\,v}$$

The reciprocal of the bulk modulus is what is known as the compressibility of a substance.

III. ELASTICITY OF SHAPE

When a rod or shaft is twisted, the two surfaces which face one another at any cross-section of it are displaced one over another in exactly the same way (though not to the same extent) in which they would be if cut in two by a pair of shears. Such a strain is called a shearing strain, and the stress (force per unit area) is called a shearing stress. The ratio of the shearing stress to the shearing strain is called the rigidity modulus.

$$\text{Rigidity modulus} = \frac{\text{Shearing stress}}{\text{Shearing strain}}$$

The rigidity modulus of any material measures its ability to resist a shear, and hence its fitness for mill-shafting, for propeller-shafts of steamships, etc. A quantitative discussion of rigidity would be too long for our limited space, but may be found in any good treatise on strength of material. Elasticity of shape is employed as a criterion by which to divide all bodies into two fundamental groups: solids and fluids. Solids are defined as those bodies which exhibit both elasticity of shape and elasticity of size. Fluids are bodies which possess elasticity of size but do not possess elasticity of shape. Bodies which exhibit no elasticity are called rigid. They do not exist in nature; but there are many bodies which we may, without error, treat as rigid. See Watson's *Physics* or Minchin's *Statics* for an excellent account of this subject. HENRY CREW.

El'aters (in plants). Peculiar cells which develop among the spores in the sporecases of many liverworts, as *Marchantia*. They are long, slender and spirally thickened, and by their jerking movements help to scatter the spores. See HEPATICÆ.

Elba. See NAPOLEON.

Elbe, a large river of northern Europe, takes its rise from the flowing together of many small streams which have their origin on the southern side of the Giants' Mountains on the northern border of Bohemia. Its total length is about 725 miles, and it is navigable for 525 miles, but for seavessels only up to Hamburg (84 miles). Of its many tributaries the most important are the Moldau, Eger, Mulde, Saale and Havel, and in connection with these is a fine system of canals. The general direction of the river is northwestward, and it empties into the North Sea at Cuxhaven, where its mouth is ten miles wide. Within the mouth, which really is an arm of the sea, the tide rises about ten feet. The numerous islands between Hamburg and Harburg divide the river into several branches, and between Hamburg and the sea the sandbanks and shoals leave only a very narrow channel. The navigation was formerly hindered by all sorts of tolls, but these were all abolished in 1870.

Elberfeld (*ĕl'bēr-fĕlt'*), one of the manufacturing capitals of Germany, is situated 16 miles from Düsseldorf, on a small stream flowing into the Rhine. The town is famous for its dyeing, bleaching and calico-printing establishments; also for large manufactures of cotton, silks, tapes, ribbons, thread, lace, buttons, fancy woolen goods, etc. Its Turkey-red dyeworks are especially noted. There also are manufactures of machinery, iron and steel wares, pianofortes, paper and carpets, besides large breweries. For miles around an immense number of weavers labor for the Elberfeld factories. Population, 170,118.

El'der. A species of *Sambucus*, a genus belonging to the honeysuckle family. They are shrubby plants with pinnately compound leaves and numerous small white flowers in flat clusters, followed by

characteristic black, purple, red or (rarely) white berries. The stem contains a conspicuous pith. The genus contains about 20 species widely distributed, about five occurring in the United States. The two eastern forms are *S. canadensis*, the American elder, with purple or black berries; the other is *S. pubens*, the red-berried elder.

El'don, John Scott, an English lord-chancellor, better known as Lord Eldon, was born in 1751. After studying at Oxford University for some years, he took to the law and soon gained great success as a lawyer. He entered the house of commons in 1783, was knighted and appointed solicitor-general in 1788, and made attorney-general in 1793. In 1799 he was appointed chief-justice of the court of common pleas, and in 1801, as Baron Eldon, he became lord-chancellor, a position he held, with only a short intermission, for twenty-six years. He died in 1838.

El Dorado (*ĕl'dō-rä'dō*), meaning the golden or gilded land, was a country supposed by the Spanish discoverers of America to exist somewhere in the New World. Their imaginations were fed by stories of the natives, and after the voyage of Orellaña down the Amazon in 1540 the report was greatly enlarged, and the locality of the fabulous region was placed near the head-waters of the Orinoco. Many a soldier of fortune perished in the search for it, and many a troop of adventurers came back with only a small part of their original number, before the city of gold was reluctantly looked upon as a fable of greedy minds, which liked to dream of greater rewards than the riches of Mexico and Peru. The most famous expeditions were those of Philip von Hutten and of Sir Walter Raleigh; a subsequent quest was that of Antonio Santos as late as 1780. See Von Langegg's *El Dorado*.

Elections. An election is the act of selecting a person or persons for some office. Elections often take place at stated intervals in connection with clubs, societies and similar organizations, with a view to having the different offices of the organization filled by the best available persons.

An election in politics is the act or process of publicly choosing by vote a person or persons for public office. In general, the most important political elections are those for the legislative bodies of the various countries and, in republics, the election of the president. It has been found necessary to pass many laws for the regulation of important elections, with a view to the prevention of bribery and corruption. In the United States, Federal laws regulate the election of Federal government-officials, such as the president, vice-president and members of Congress, while state-laws regulate the election of state officials. Voting is now usually by ballot.

A ballot formerly signified a little ball used in secret voting, But voting by ballot has now come to mean simply secret voting, irrespective of the particular means used. The commonest form of ballot now in use is that of a ticket, with the names of the candidates for the office printed upon it. The voter casts his vote by putting some mark, such as a cross, opposite the name of the person or persons for whom he wishes to vote. Sometimes the names of all of the candidates are arranged in separate columns on the ballot, all the Republican candidates in one column, all the Democrats in another, etc. One object of this is to encourage the voter to vote a straight ticket, that is, to vote for all the candidates of the one party to the exclusion of all the candidates of the other party. The expense of preparing and distributing the ballots is now usually borne by the state.

A majority is simply the excess of votes that one party receives over another party or parties at an election. For instance, if A receives 100 votes, B 80 and C 60, A has not a majority, as he received only 100 votes out of 240, or less than half of the total number of votes cast. If A had received 200, B 80 and C 60, A would have a majority of 60.

A plurality, on the other hand, is the number by which the votes for the highest of a number of candidates exceed those of the next highest candidate, when the candidate receiving the greatest number of votes has not a majority of all the votes cast. Thus, if A receives 100 votes, B 80 and C 60, A has a plurality of 20, having 20 more than the next highest candidate B. Sometimes the word majority is loosely used in the sense of plurality.

A primary election is the means used to nominate the candidates for office in a general election. Only members of the particular party concerned take part in in it; that is, there are Republican primaries for nominating the candidates of the Republicans and Democratic primaries for nominating the Democratic candidates. In many places the primary elections have at times degenerated into selfish partisan organizations from which the majority of the voters of the party were excluded. Abuses of this nature have led to the passing of laws in many states for rigidly regulating the primary elections. These laws in the main provide that sufficient public notice of the meeting shall be given, that the voting shall be by ballot, that the election-officials shall be sworn, that frauds shall be duly punished and that the expense involved, except in a few cases, shall be borne by the state.

Electoral College. The persons who, according to the political system of the United States, are chosen by the people

of the different states to elect the president and vice-president are called electors, and the electors of all the states form the electoral college. Each state chooses a number of electors equal to the number of members it sends to both houses of Congress; but no member of Congress or person holding civil office under the United States can serve as an elector. The electors are chosen on the Tuesday after the first Monday in November in every fourth year preceding the year in which the presidential term expires. They meet in their respective states on the second Monday in January, and cast their votes. They were originally intended to use their own judgment in casting their votes, but now they simply vote for the candidates nominated by the party by which they have been chosen as electors. The votes are then opened and counted by both houses of Congress, in joint session, on the second Wednesday of February. If no candidate has a majority of all the votes, the house of representatives chooses the president by ballot from the three who have the highest number of votes, each state having one vote; the vice-president is similarly chosen by the senate. See Johnson's *American Politics* and Andrews' *Manual of the Constitution.*

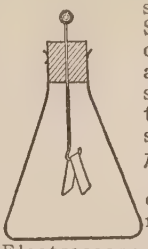
Electricity. The rubber handle of a fountain-pen when rubbed over the sleeve of one's woolen coat, acquires the property of attracting small bits of paper or wood; glass rubbed on silk behaves in the same way. The substance earliest discovered to have this property is amber, a fossil resin found on the shores of the Baltic Sea. The Greeks called this resin electron, and hence later (1603 A. D.) Dr. Gilbert called this phenomenon electric, and gave us our word *electricity*. These facts have been known ever since the time of Thales (600 B. C.); and for two thousand years following him they constituted the whole of electric science, barring some knowledge of lightning and the electric eel, which no one then imagined to have any connection with the amber phenomenon.

Bodies which have acquired the property of attracting small bits of paper are said to be electrified or to have an electric charge.

I. ELECTROSTATICS

The fundamental facts upon which the science of electrostatics (*i. e.*, the science which deals with electric charges) is built, are as follows:

1. From a large number of experiments it has been found that not only rubber or amber but *any* substance, on being rubbed with any other substance, becomes electrified. Even the tip of a camel's-hair brush, when touched to a table-top, shows electrification. Of course this requires some delicate means of detecting the electrification, such as a pair of gold leaves suspended on a glass support. Such an instrument is called an electroscope and is shown in fig. 1. Since electrification is produced by such slight means, we are led to think that "any two substances brought into contact become electrified." This statement may be called the *first law of electrostatics.*



Electroscope made of Erlenmeyer Flask and Aluminium Foil

2. A second fundamental discovery in electrostatics was made by Stephen Gray (died 1736) in London. He found that when some bodies, such as metals, are electrified, the charge immediately leaks off unless the metal be supported upon glass, rubber, resin, etc. Those substances which lead off the charge quickly, he called conductors; those which prevent the charge from escaping, he called non-conductors or insulators. There are some substances, as gas, carbon, ordinary water, cotton-thread, which occupy an intermediate position between conductors and non-conductors. See list in any good treatise on electricity.

3. A third great discovery in electrostatics was made by Dufay (see DUFAY), who found that all electrified bodies may be divided into two classes according as they attract or repel a given electrified particle—such as a pith-ball suspended by a silk thread and charged. The electrification which appears on glass when rubbed with silk Dufay called vitreous; we now call it positive. That kind of electrification which appears on sealing-wax or gutta-percha when rubbed with flannel, he called resinous; we now call it negative. Bodies charged with the same kind of electrification repel each other; bodies charged with opposite kinds of electrification attract each other.

4. Just "how much" two charged bodies attract (or repel) each other was first measured by the French physicist Coulomb (born 1736; died 1806). His answer constitutes what we may call the fourth great discovery in electricity. By means of a torsion-balance he found that two particles at a distance r from each other, and carrying charges e and e 1 respectively, attract or repel one another, *in air*, with a force F, which is given by the following equation:

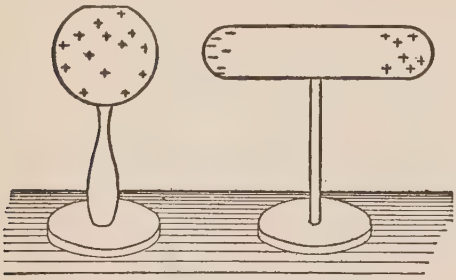
$$F=\frac{ee\acute{e}}{r^2}$$

Cavendish and Faraday found later that this expression had to be modified, when the medium between the two particles was other than air, so as to read:

$$F=\frac{ee\acute{e}}{Kr^2}$$

where K is a constant which is known as the specific inductivity of the medium: for ordinary glass its numerical value is about six, for paraffine about two.

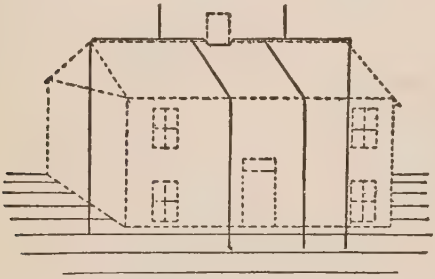
5. Stephen Gray found that he could charge a conductor by simply bringing it into



The phenomenon of electrostatic induction

the field of another charged body. If now the conductor be connected to earth and immediately afterward disconnected, it will be charged with electrification opposite in sign to that of the original charge. This is known as the phenomenon of electrostatic induction, and will be clear from Fig. 2.

6. A sixth important fact was thoroughly established by Faraday: When electrification is produced by friction, by induction or by any other means, the



Maxwell's method of protection against lightning

positive and negative charges so produced are always equal.

7. Faraday also established the fact that the charge on the outside of any closed conductor is distributed in such a way that it produces no electric field—no electric force—inside the closed conductor. It was with this principle in mind that Maxwell suggested, as the best method for protecting houses from lightning, to place them in a network of conductors (see fig. 3) which shall as nearly as possible be equivalent to a closed conductor. For more extended description of the phenomena of electrostatics see S. P. Thompson's *Elementary Lessons in Electricity and Magnetism*. For a simple and interesting mathematical discussion of the subject see J. J. Thomson's *Elements of Electricity and Magnetism*.

II. ELECTRIC CURRENTS

If two charged conductors are connected by means of a wire, it is observed that in general the wire and the region about it acquire new and remarkable properties. The wire itself becomes warmer, and the region about it becomes a magnetic field. A wire which possesses these properties is said to have an electric current flowing through it. For methods of detecting the presence of an electric current in any circuit see GALVANOMETER.

There are many methods of producing electric currents but the most important ones from a practical point of view are the three following: the method of Galvani and Volta—the so-called voltaic cell; the method of Faraday—cutting lines of magnetic force—exemplified in the ordinary dynamo; and the thermo-electric method discovered by Seebeck.

THE VOLTAIC CELL

Volta discovered in 1800 that, by joining in series two conductors of the first class (see ELECTROLYSIS) and one conductor of the second class, he could obtain a continuous electric current at the expense of the chemical energy stored up in the liquid and the metals. Two conductors of the second class, together with one of the first class, will also produce a continuous current. Such a combination as either of the preceding is called a voltaic cell. A typical cell of this kind is one in which a strip of zinc is immersed in a solution of zinc-sulphate and a copper strip in a solution of copper-sulphate, the two solutions being separated by a porous partition. It is then found that, on joining the copper and zinc terminals with a wire, the positive electricity flows along the wire from the copper to the zinc. Accordingly, the copper is called the positive pole and the zinc the negative pole of the battery. Since, however, inside the cell the current flows from the zinc to the copper, the zinc-plate is called the positivee lectrode and the copper-plate the negative electrode. (See ELECTROLYSIS.)

There is a great variety of cells; some adapted to one purpose, some to others. The one just described is known as the daniell cell. In the storage-cell the electrodes are of lead and lead-peroxide respectively, and the electrolyte is dilute sulphuric acid. The lead-plate is the negative one; the lead-peroxide is the positive one. When the circuit is closed, the lead-peroxide plate gives up a part of its oxygen, while the lead-plate, the negative electrode, becomes oxidized, until finally the two electrodes become very much alike and the current, therefore, becomes less and less, other things being the same. The battery is now said to be discharged. For two electrodes which are alike never give a current when immersed in any one electrolyte. But in order to put the cell again in good working shape, it is necessary only

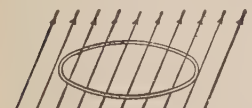
to pass an electric current through the cell in a direction opposite to that obtained when the cell was in use. This process is known as *charging* the cell. The charging simply restores the oxygen to the positive plate, and removes the oxygen from the negative plate, leaving it spongy, metallic lead.

The following two features distinguish this from most other voltaic cells: The plates are prepared, *i.e.*, made chemically different, by electrical means. They are capable of yielding currents which are enormous when compared with those from other forms of batteries.

INDUCTION OF ELECTRIC CURRENTS

Faraday in 1831 succeeded, by a beautifully simple method, in producing electric currents without the use of the voltaic cell and without the use of heat.

If we consider any closed circuit (say a piece of copper wire bent into the form of a circle or square) placed in a magnetic field, we may think of it as containing or inclosing a number of lines of force, as a fence might inclose a group of trees. In Fig. 4 six lines of force are represented as inclosed by the wire-circle. If by any means the magnetic field were made twice as strong, we should represent this change by drawing the lines of force twice as close together, so that now the circle would inclose twelve instead of six lines. Or, if the copper-circle were carried parallel to itself to another region where the magnetic field were not so strong, then we should describe this change by drawing fewer lines of force through the circle. Faraday's discovery was simply this: "When, by any means whatever, the total number of lines of force passing through any circuit is changed, an electric current is produced in that circuit." Such a current is called an induced current.



Magnetic Line of Force inclosed by an Electric Current

This discovery of Faraday's is frequently, and perhaps fairly, considered the most important one ever made in electrical science; since upon this principle are constructed the dynamo, the telephone, the transformer, etc. See articles on these three subjects.

THERMO-ELECTRIC CURRENTS

Seebeck in 1821 discovered that, when a closed circuit is made up of two different metals and the two junctions of the metals are kept at different temperatures, an electric current flows around the circuit. The source of energy which supplies this current is the heat absorbed at the hot junction. The presence of such an electric current as this in a circuit is one of the most delicate tests known for a difference of temperature between the two junctions.

EFFECTS OF ELECTRIC CURRENTS

1. *Chemical Effects.* (See ELECTROLYSIS.) One of the chemical effects of an electric current has been employed to define the size of the unit of current, for the international congress of electricians at Chicago in 1893 agreed to define the unit-current as one which deposits silver at the rate of 0.001118 grams per second. This unit is called an ampère. See AMPÈRE.

2. *Heating Effects.* Everyone who has seen an incandescent lamp knows that an electric current in passing through a carbon filament may raise its temperature to such a point that the carbon becomes white-hot. Joule, the English physicist, showed that the amount of heat developed between any two points in a conductor varies directly as the square of the current, directly as the time and directly as a constant depending upon the shape, size and chemical composition of the wire. Let us denote the heat developed by H, the current by C, the time by t and the constant for any conductor by R. Then by properly choosing this constant we may write:

$$H = C^2Rt.$$

The constant R thus defined is known as the electrical resistance of the wire. The resistance of a wire may then be considered as a quantity which determines how much heat will be developed in it in a given time by a given current. The size of the unit of resistance is that offered by a column of mercury of uniform cross-section, at 0°C, when its length is 106.3 centimeters and its mass is 14.4521 grams. This unit is called an ohm.

3. *Magnetic Effects.* About every wire conveying a current is a magnetic field. This field may be represented by drawing closed lines of force including the current. It is these lines of force which magnetize a piece of iron placed in a coil of wire carrying a current. The behavior of the electromagnet and the telegraph-sounder depends upon this principle. An exceedingly important inference from this magnetic effect is the fact that an electric current, in any movable circuit, always sets itself so as to include as many lines of force as possible. This is the principle of the instrument which Lord Kelvin devised in 1867 for receiving messages over the Atlantic cable. It is, indeed, the principle of all galvanometers with movable coils and of all electric motors.

OHM'S LAW

A dynamo or a voltaic cell may be considered as an instrument for driving an electric current through a circuit or, in short, as an instrument for producing electrical pressure. Ohm, a German mathematician, showed in 1827 that

1. When, in any circuit, the electrical pressure remains constant, the current varies inversely as the resistance. 2. When, in any circuit, the current is to remain constant, the electrical pressure must be varied directly as the resistance varies. 3. In any circuit in which the resistance is kept constant, the current varies directly as the electrical pressure.

These facts together constitute Ohm's law, and may be expressed algebraically as follows: When C denotes current, R resistance and E electrical pressure, then

$$C=\frac{E}{R}$$

The quantity which we have called electrical pressure is generally called electromotive force. The unit of electromotive force is that which will send a current of one ampère through a resistance of one ohm. This unit of electromotive force is called a volt. Electromotive force is very frequently denoted by E. M. F. The E. M. F. of a daniell cell is very nearly one volt; that of a lead storage-cell is approximately 2.1 volts.

ELECTRICAL UNITS

These three units, the ampère, ohm and volt, whose standard values we have given above, are all logically connected with the three fundamental units, the centimeter, the gram and the second; but the reasoning which leads to the arbitrary definitions given above is too long for this brief sketch. For a full account of this matter see Thomson's *Elements of Electricity and Magnetism* or Thompson's *Elementary Lessons in Electricity and Magnetism.*

HENRY CREW.

Electric Lamps are of two kinds: arc and incandescent. Both depend upon the general principle that the heat developed in any part of a circuit by a constant electric current varies directly as the resistance of that part of the circuit; or, what is the same thing, the heat developed in an electric circuit by a constant electromotive force varies inversely as the resistance. (See ELECTRICITY.)

THE ARC-LAMP

The arc-light was first employed by Sir Humphry Davy, but it became a commercial success only after the modern dynamo had been perfected, say about 1876. An arc-lamp consists generally of two carbon-poles connected with some source of current exerting an electrical pressure of from 30 to 90 volts between the terminals of the carbon. The arc is started by bringing the carbon-poles into contact, and then slowly separating them by a distance of a millimeter or more. The resistance of the vapor thus formed between the poles is so large, that an enormous amount of heat is developed and the ends of the carbon-poles become white-hot. The positive pole becomes much hotter than the negative pole, so that for purposes of illumination the positive pole is generally placed above the negative one; and when the arc is used in a projecting-lantern the positive pole is always made to point forward, *i.e.*, toward the screen. The temperature of the arc is unknown, but an average of the best measurements indicates that it is about 3,600° C. Owing to the fact that the oxygen of the air is electronegative, the positive pole is consumed about twice as fast as the negative. Hence the arcs used for street-lighting (and therefore automatically fed) are so arranged that the positive carbon is fed in twice as rapidly as the negative. These street-lights are always arranged in series, from twenty to fifty being placed on each circuit, according to voltage. The arc-lamp has been greatly improved for many purposes by inclosing it in a small glass-hood, which prevents easy access of air and thus greatly lengthens the life of the carbon. This hood at the same time acts as a diffusing screen, and decreases the fierceness of the light.

THE INCANDESCENT LAMP

The incandescent lamp with the carbon filament, was perfected by Edison in 1878, and became a commercial success with the perfection of the dynamo. The lamp consists of a slender filament of conducting carbon inclosed in a highly exhausted glass bulb. The resistence of this carbon-filament, varying from a few ohms to several hundred ohms, is high compared with the resistence in the rest of the circuit, so that nearly all the energy of the circuit is used in producing heat in the filament to raise it to incandescence. The source of current is ordinarily the mains from a central electric station, but an isolated dynamo or a storage battery may be used. Most incandescent lamps are made with filaments which become white-hot under a pressure of 110 to 114 volts. The carbon-filament lamp has since 1910 been largely replaced by lamps having filaments of metallic tungsten. The tungsten filament can be safely raised to a much higher temperature than can the carbon filament, and the luminous efficiency is thus nearly three times greater than the efficiency of the carbon filament. The carbon filament requires normally about three watts per candle-power, while the tungsten takes only one and a quarter watts per candle-power. The efficient life of the lamp is also longer. The tungsten lamp is made in a great variety of sizes and shapes for different uses. For interior lighting it has practically replaced all other electric lamps, and in many places it is replacing arc-lamps for street lighting.

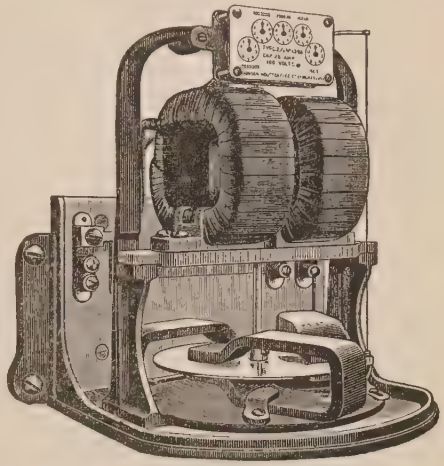
In what is known as the Nernst lamp, the

incandescent body is a rod or filament of magnesium-oxide which is a poor conductor when cold but a good conductor when heated. To start it, it is necessary to apply a match or heat it electrically by means of a platinum wire. For the various methods of distributing incandescent lamps, see any treaties on electrical engineering.

Electric-Light Bug, a large water-bug common in the United States. The bugs fly readily from pond to pond. Formerly they attracted no general attention; but, since our cities have been lighted by electrical lights placed on high elevations, they are at times very common in cities. They fly into the electric light and are killed by hundreds and have been the occasion of frequent mention by the public press. They are not, however, of recent appearance in this country, as is sometimes supposed. They are true bugs, living in the water, with a sharp beak used for puncturing their prey. They attack snails, small fish and, occasionally, a frog, and suck the blood. They reach a length of more than two inches, and have long been known to observers of insects under the names giant water-bug and water-scorpion.

ELECTRIC BUG

Electric Meter, a piece of apparatus for measuring and recording the electric energy consumed in a circuit. Several forms of electric meter have been devised, but the only kinds in general use are the clock and the motor-meter. The clock-form of meter is much used in Europe, but not in the United States, In the Aaron meter, a clock-form, the pendulum of a clock has a magnetic bob, which swings over a coil carrying the current, and thus the change in the rate of the clock depends on the current. This change in rate is recorded on one or more dials, and these are graduated in electrical units. The only meters in general use in the United States are motor-meters. A motor-meter is a small electric motor so made that the number of revolutions of the armature is proportional to the electric energy consumed in the circuit in which the motor is placed. The total number of revolutions is recorded on a dial by a simple mechanism. The meter is usually incased like a gas-meter with only the dial visible. Electric meters record in some unit representing power multiplied by time, as watt-hour, measuring a watt of electric energy for one hour, or lamp-hour, measuring the energy required to run one 16-candle-power incandescent lamp for one hour. For incandescent-lighting circuits where the pressure remains



AN ELECTRIC METER

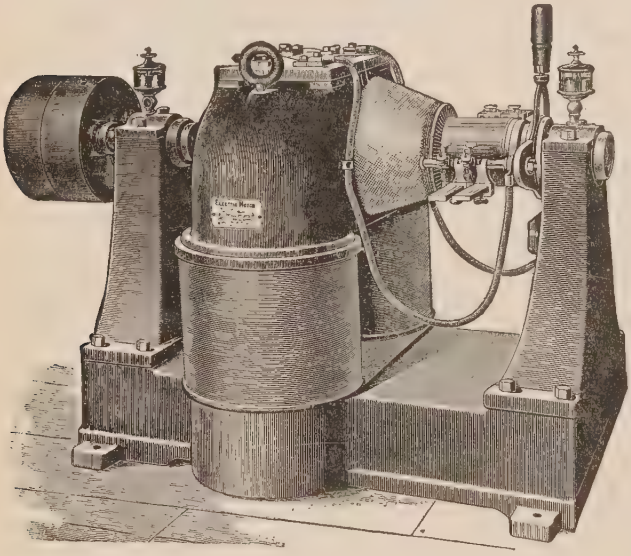
constant, the meter need record only current (ampères), but on motor-circuits the meter must be a true watt-meter, that is, record pressure times current (volts × ampères).

Meters are either for direct or for alternating circuits. A. C. meters are usually some form of induction-motor. (See ELECTRIC MOTOR.) Among the best-known electric meters are the Shallenberger, Thomson and Stanley meters. Meters are now used by most large central stations in measuring electric energy supplied for all purposes. The accuracy for their whole range of loads is within 2% for the best meters, while for mean loads the accuracy is much greater.

Electric Motor, a machine for transforming the energy of an electric current into mechanical power. The modern direct-current motor may be looked upon as a reversed dynamo. In fact, any direct-current generator will run as a motor if current is passed through its armature and field-magnets, and in general an efficient generator is an efficient motor. But not all electric motors are good generators, for motors are often constructed for special purposes. Thus the street-car motor, for obvious reasons, is made with light field-magnets. But the general description of a D. C. dynamo applies directly to a D. C. motor.

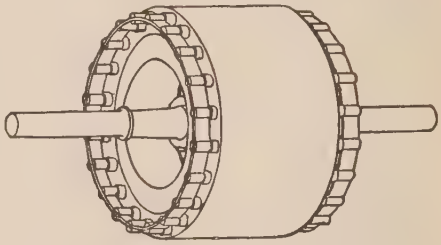
An alternating-current dynamo will run as a motor when supplied with the proper alternating current, provided it is first brought up to its normal speed as a generator. After that it runs synchronously

with the generator, unless overloaded, when it will stop. Such a motor is called a synchronous motor. Synchronous motors have the disadvantage of requiring an auxiliary starting-motor. They are seldom used, except in very large plants where the load is required continuously. There are several long-distance transmission-plants in the Rocky Mountains using synchronous motors. All practical self-starting A. C. motors are induction-motors. This motor is based on a discovery of Professor Ferraris of Turin University, Italy, but the first commercial induction-motors were due to Tesla. The armature of an induction-motor is a closed coil without commutator, collector-ring, brushes or external circuit. The multipolar field-magnets are excited by two or more alternating currents which differ in phase. By proper windings and connections of the coils of the field-magnets, there is thus produced a magnetic field which changes both strength and direction, a so-called rotary field. This induces currents in the armature-coils, and carries the armature with it. Induction-motors are self-starting, are simple in mechanical construction, require little attention in operation and are efficient; but they require two or more separate currents to operate them. These currents, however, are generated by a single dynamo. Induction-motors at present are not adapted for purposes where the speed has to be varied, as on street-cars. For small motors, such as fan-motors, the two phases can be obtained by splitting a single-phase current, but this method has not been successfully used on large motors. Both two and three phases are used in A. C. motors.



A DIRECT-CURRENT MOTOR

The first persons to make practical use of electric motors were Jacobi, Davenport and Page. Jacobi ran a boat carrying 14 passengers at St. Petersburg in 1838. Davenport had an experimental electric railroad at Springfield, Mass., in 1835 Page ran a 16 H. P. electric locomotive



ARMATURE OF AN INDUCTION-MOTOR

at a speed of 19 miles per hour on the railroad between Washington and Baltimore in 1851. All obtained their electric currents from primary batteries. The first case of running a motor from a dynamo was that of Fontaine and Breguet, at the Vienna exposition in 1873. The distance between the generator and motor was over a mile. Electric motors are now used in every place where power is needed. The fact that in many shops electric motors are placed on each machine, the motor-efficiency being higher than that of shafts and belting, speaks for the efficiency of the modern electric motor. Additional information upon both the scientific and practical aspects of the generation and transmission of electrical power and its use in street railway systems will be found in the articles on TRANSMISSION OF POWER and the ELECTRIC RAILWAY. A. P. CARMAN.

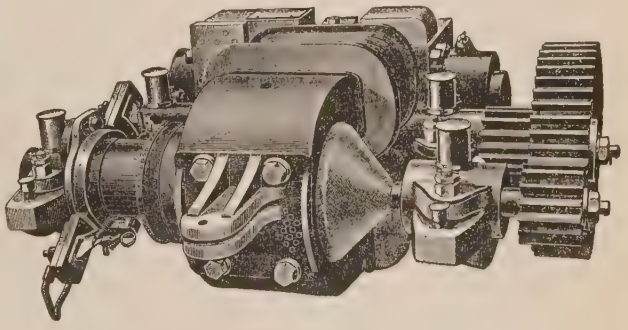
Electric Railway, a railway using electric motors to move its cars. The first electric railway was a small line built by Thomas Davenport, at Springfield, Mass., in 1835. In 1851 Prof. C. G. Page ran a 16 H. P. electric locomotive at the rate of 19 miles per hour near Washington. The currents in the above cases were from primary batteries, too costly a source for commercial purposes. In 1879 Werner Siemens ran an electric railway 900 feet long at an exhibition held in Berlin; and two years later a line, 1½ miles long, was opened in a Berlin suburb. The currents were generated by dynamos. During the next few years various experiments were made with varying success. The first line which can be said to have been an engineer-

ing success was that put in at Richmond, Va., by F. J. Sprague in 1887, and most of the features that have been developed and used in our present street-systems of electric traction are found in Sprague's road. These features are one or two motors supported under the cars and geared to the axle; a switch and controller on the platform by which the speed and direction of the motor can be controlled; a single, overhead wire, suspended over the track by insulating supports, for bringing the current; a trolley-wheel carried on a pivoted pole from the car-top to connect the trolley-wire with the motor; a return-circuit through the rail and ground to the power-station. The currents are generally used at a pressure or potential of 500 volts. The current for the trolley-wire is carried by feeders, large wires, which run overhead (or underground in large cities) from the power-station, and are connected at various points with the trolley-wire. The return-currents through the ground have introduced most troublesome problems, owing to the electrolytic action on pipes for water and gas and on street-foundations. (See ELECTROLYSIS.) For means of suspension of motors from car, special trucks required, methods of control of motor-speeds, the question of lines and line-insulation and other special engineering problems that have been so successfully met, the reader must consult the technical books and journals.

The overhead trolley-wire has been replaced in some large cities by an underground conduit-system and for most elevated railroads by the third-rail system. The underground conduit-system is used in Washington, D. C., in New York city and in several European cities where the overhead wire was not considered safe, and not sightly. A small tunnel or conduit runs below the surface between the tracks, and in this is a slit for an arm which extends down from the car. The trolley-wire is carried on insulated supports in this conduit, and contact is made with it by brushes on the arm from the car above. The success of this system depends on the maintenance of insulation of the wire in the conduit, often a difficult problem owing to moisture and dirt, but successfully solved in the cities mentioned. The installation of the conduit-system is very costly, and pays only in large cities where the traffic is large. In the third-rail system an ordinary steel track-rail is carried on the insulators, supported on the wooden sleepers about a foot to one side of the track. This third rail takes the place of the trolley-wire. It has proved successful on elevated railways, as on those of Boston, New York and Chicago.

The electric railway has superseded horse and cable cars for urban and suburban travel. It was introduced in 1887. By 1890 there were over 2000 miles of track operated by electric traction in the United States as against 6000 by horses and 500 by cable. Twelve years later there were over 41,000 miles operated by electricity. The number of electric cars in the United States is estimated at 100,000. The capital invested in the industry is five billion dollars, and the revenue is $585,000,000. The power plants of some of the electric traction lines are the largest known. Single units generating from 20,000 to 30,000 K. W. are in use, Statistics show that the electric cars carry annually over 26,000,000 passengers per day in the United States. The electric railway systems have extended into the country-districts, making those districts residences for workers in the cities. They also form connecting lines between cities, in many cases carrying traffic that was formerly taken by the steam railroads.

For underground railroads in the cities and for tunnels, the electric system has not only the advantages of efficiency and economy, but the great advantage of producing no smoke. The underground roads in New York city and in London are operated by electricity. The use of electric power instead of steam for standard railroads has been much discussed. The railroad between New York city and New Haven with its heavy traffic has used electric power for several years. In 1918 the C. M. & St. P. Railway completed the electrical equipment of a division of 440 miles across the mountains in Idaho and Montana, replacing steam locomotives by electric locomotives for both passenger and freight service. The power comes from hydro-electric plants. The application of electric traction to trains of more than two or three cars requires a heavy electric locomotive or a special system of control for the connected motor-cars, so that the motors on each car can be controlled by one motorman. The only system in use is



A STREET-CAR MOTOR

the Sprague multiple-unit system. (See *Street Railway Journal, May, 1901*). The alternating-current motor is not used for street railway work, as it requires a double-trolley line and present forms present serious problems in speed regulation. Alternating motors are however in use in some special cases as in some heavy mountain railway lines in Italy. The storage battery was at one time used on a number of street-car lines, but the weight of the battery and so rapid deterioration under traffic conditions were disadvantages and it is not now used.

The power-plants of some of the electric railways are the largest known. The electric-railway systems have extended far out into the country districts, making those districts residences for workers in the cities. They also today form connecting lines between cities. For underground railroads the electric system has not only the advantages of economy and efficiency but that of producing no smoke. At present no long overland trunk-railroad is operated by electricity, although such schemes have been suggested. It is not a question of engineering but of finance, and high-speed. Heavy electric roads are likely to come when the traffic will support trains at short intervals. The application of electric traction to trains of more than several cars requires a large electric locomotive or a special system of control, so that the motors on each can be controlled by one motorman. A. P. CARMAN.

Electric Welding, the process of welding two pieces of metal together by using the heat produced by an electric current. The process developed by Elihu Thomson is practically the only one used. In this the pieces to be welded are held in proper supports, and a large electric current at a very low pressure is sent through the joint from piece to piece. The passage of a large current causes a local production of heat in the metals on each side of the joint, and the metals are pressed together when at the proper temperature, a perfect weld being formed. Practically all kinds of metals can be welded in this way, and even different metals can be welded together, as copper and brass. Welds can also be made by this method in pieces whose shape would prevent welding by ordinary processes. The current used is an alternating current, often of thirty or forty thousand ampères and of correspondingly low pressure. Welding-currents are produced by a special transformer which forms part of the apparatus. The apparatus takes different forms, depending on the shape and size of the work to be handled. For joining two wires it has a very simple form, but for welding pipe or welding artillery-projectiles machines of special form are required.

Electrolysis. Volta, the inventor of the battery, showed that conductors of electricity may be easily divided into two different classes by considering their behavior while an electric current is passing through them. In one group of conductors, as iron, carbon, mercury, etc., we find that the current produces no change in the chemical composition of the body; while in the other group (which includes such bodies as solutions of table-salt, silver-nitrate, copper-sulphate, etc.) the current breaks up the salt, which is so dissolved, that at the point where the current enters the solution we get one constituent of the salt and at the point where the current leaves the solution we get the other constituent of the salt. Bodies which are not decomposed by the current, Volta called conductors of the first class; those which are broken up by the current, he called conductors of the second class. Sir Humphry Davy, in the first decade of the 19th century, established the fact that, when a current is passed through a solution, that solution is, in general, broken up into "two" other substances. It remained for Faraday, however, in 1834, to give an accurate description of the phenomena which accompany the passage of a current through a conductor of the second class. To Faraday, also, we owe the nomenclature of this subject. The wire by which the current enters the solution he called the anode; the wire by which it leaves he called the cathode; the solution itself was called the electrolyte; and the process of decomposition by an electric current was called electrolysis. The parts into which the electrolyte is decomposed are called ions. Faraday's most important discoveries are summarized in the two following laws:

I. "The amount (*i. e.* the mass) which is decomposed by an electric current is proportional to the current flowing and to the time during which it flows.

II. "When an electrolyte or a series of electrolytes is decomposed by an electric current, the components into which it is separated are always chemically equivalent *i. e.*, they are set free in just such amounts as may recombine and form a chemical compound without any left-over material."

The applications of electrolysis in commerce are very numerous. Among the most important may be mentioned: (1) plating baser metals with gold, silver or nickel; (2) electrotyping, used in all kinds of printing; (3) the separation of metals, especially copper, from their ores; (4) in defining the legal unit of current, *i. e.*, the ampère; (5) in electro-glazing; (6) in the manufacture and charging of storage-cells. Within the last few years electrolysis has found an unfortunate though important application in the destructive effects of trolley-line currents upon the water-mains in our larger cities. When the return-current leaves the iron pipe and enters the moist ground, a certain amount of the iron is dissolved.

For an excellent brief account of this

THREE MONSTERS OF OTHER DAYS

Skull of an Eyrops, chief prey of the Naosaurus.

That "hairy elephant" is a mastodon. His bones were found in New York. He measured 14 ft. 11 in. from the base of tusks to tail. The artist is modeling the Naosaurus or fin-backed lizard, whose skeleton was found in Texas. The Naosaurus was 9 ft. long and 5 ft. high.

A HERD OF WILD ELEPHANTS

Captured and placed in a strong pen. After they have become somewhat tamed they are lassoed and taken out separately.

entire subject, see Hastings' and Beach's *General Physics*. Read Faraday's papers, in Harper's *Scientific Memoirs*.

Electron. (See ATOM.)

Electrotype. The art of copying printing-type, wood-cuts, seals, medals, engraved plates etc. in metals, especially in copper, by means of a galvanic current, is called electrotyping. The process, briefly, is this: An impression of the thing to be copied is first taken in gutta-percha, sealing-wax, fusible metal or any substance which, when heated, takes a sharp impression. While this impression—say in gutta-percha—is still soft, a wire is inserted into the side of it. As gutta-percha is not a conductor of electricity, it is necessary to make the side on which the impression is taken conducting, and this is done by brushing it over with plumbago by a camel's-hair brush. The wire is next attached to the zinc-pole of a weakly charged galvanic battery, and a copper-plate is attached by a wire to the copper-pole of the cell; or the required current may be supplied by a dynamo-electric machine, as is now usual. Then the impression of the plate to be copied is dipped into a copper-solution. The copper of the solution begins to be deposited on the impression, first at the black-leaded surface near the connecting wire, then gradually over the whole conducting surface. After a day or two by the old method—in a few hours now with the new inventions in electrical machines—the impression is taken out; and the copper deposited on it, which has formed a tolerably strong plate, can be easily removed by putting the point of a knife between the impression and the edge of the plate. On the side of this plate, next the mold, we find a perfect copy of the original wood-cut. If a coin or medal is taken, we may proceed in the same way or take the medal itself and lay the copper on it. In the latter case, however, the first cast, so to speak, is negative; that is, showing depressions where the medal is raised; this negative can then be taken for a second copy, which will exactly resemble the original. See *Electro-Metallurgy*, by George Gore.

El'ephant, the largest of land-animals, with a long trunk or proboscis, with nostrils at its extremity and with two upper teeth developed into tusks. There are two kinds now living: the African elephant, inhabiting the greater part of Africa south of the Sahara, and the Indian, found in the forest-lands of India and southeastern Asia, including the islands of Ceylon and Sumatra. These are distinct kinds. The African form is slightly higher, with a convex forehead and very large ears—about three and one half feet long by two and one half feet broad. Tusks are carried both by male and female. The Indian form has smaller ears, a concave forehead and tusks only in the male. Elephants may reach a weight of three or four tons, and a height of eleven feet or a little more. The famous Jumbo was eleven feet, two inches, and at the time of his death was not done growing. The trunk is an elongated nose and upper lip grown together. The nostrils are at the end, as is also a finger-like tip for grasping. It is very muscular and strong, and is put to many uses in feeding, drinking, spraying, lifting, etc. The tusks of the African elephant are of a better quality of ivory than those of the Indian. Large tusks weigh 150 pounds and may exceed that weight, but the average weight is about 28 pounds, and they sell for about $300 a hundredweight. Elephants have been so extensively hunted and killed for their ivory, that their number is being reduced. The Indian elephant is domesticated, and is used in lumber-yards for piling lumber and other heavy work. It is ridden by native princes and their friends. A large saddle with a canopy, holding several persons, is strapped on the back, and the driver (*mahout*) sits astride the neck and uses a goad and hook in controlling the animal. Asian elephants are also put to other uses, but principally on state-occasions and in tiger-hunting. The hunters shoot from the backs of the elephants, while the natives beat up the jungle to drive the tiger into sight. Elephants live to an age of 120 years. In their native haunts they eat shoots and twigs of trees, various kinds of grass, bamboo, sugar-cane, reeds, etc. The food of the African elephant is of a coarser variety—larger shoots, roots of trees and shrubs. The elephant also is fond of fruit. In captivity it is fed largely on hay and carrots. It has a long memory for friends and foes, revenging itself for tricks and insults. Asian elephants were used in war by ancient warriors. Egypt and Carthage domesticated the African elephant, and Hannibal used it in his wars. For extinct species of the elephant, see MAMMOTH and MASTODON. See Halder: *The Ivory King*.

HEAD OF INDIAN ELEPHANT

HEAD OF AFRICAN ELEPHANT

Eleusis (*ē-lū'sĭs*), next to Athens the most important city of ancient Attica. It was situated on the Bay of Eleusis, opposite Salamis, and was connected with Athens by the Sacred Road. It was famous as the chief seat of the worship of Ceres (Demeter), whose mystic rites — the Eleusinian mysteries — were here performed with great pomp and solemnity from the earliest times (B. C. 1356?) till Alaric, the leader of the Goths, destroyed the famous temple of the goddess in 396 A. D. The site of the old city is now occupied by the little village of Leusina. Excavations since 1882 have revealed many remarkable ruins.

El'eva'tor, a machine for carrying passengers and freight from story to story in buildings. It consists of a car more or less open, which is raised and lowered in a suitable shaft in the building. Elevators may be moved by hand or by mechanical power. The power used is hydraulic, steam or electric power. In hydraulic elevators the power is due to the water-pressure acting on a piston working in a cylinder. Hydraulic elevators are of the ram or the suspended type. In the ram-type the car or platform is carried on a vertical rod that is attached directly to the piston of the water-cylinder. The length of the cylinder is thus the same as that of the extreme height to which the elevator rises. Such elevators are used in Europe. They are safe, but very slow, and not adapted to great heights. In the suspended type of hydraulic elevator the piston only works through a short distance, but this motion is multiplied by an inverted block-and-tackle which raises the elevator. In steam and electric elevators the wire-rope which raises the elevator-car is wound about a drum, which is revolved by the steam-engine or the electric motor. The elevator is controlled from the car by ropes or rods which act on the valves of the hydraulic cylinder or on the starting and stopping devices of the engine or motor. Various safety-devices are used to prevent a fall of the elevator-car in case of the breaking of the rope, and accidents seldom take place. Elevators are an absolute essential to the modern tall building in the city. The speed used in elevators is several hundred feet per minute, and they can be used for any height. The elevator in the Washington monument runs 500 feet. This is one of the highest elevators in the world.

Elgar, Edward William, a prominent English composer, was born at Broadheath, near Worcester, on June 2, 1857. His *Dream of Gerontius* brought him great fame in 1900. This has been maintained by the large works that have followed: *The Apostles* and *The Kingdom.* The list of his orchestral and smaller compositions is considerable, and has aided in placing him in the first rank of contemporary composers.

Elgin (*el'jĭn*), a city in Kane County northwestern Illinois, on Fox River, 36 miles northwest of Chicago. It has a large dairy-business, with extensive milk-condensing factories, supplying Chicago with butter and other dairy-products. It has large manufactories of carriages, shoes, farming-implements and washing-machines. Its other industries include meat-packing establishments, cotton-mills, soap-factories, etc. It is best known, however, as the seat of the watch-works, which employ 3,000 workmen and produce 1,800 watches daily. It was one of the first watch-factories in the United States, and the Elgin with other American watches has largely taken the place of foreign watches in the trade. The Northern Illinois Hospital for the Insane is at Elgin. There are excellent public schools, many handsome churches and a public library. Elgin is located on an extensive system of interurban electric lines. Population, 25,976.

Elgin Marbles, a celebrated collection of ancient sculpture brought from Greece (1801-03) by the Earl of Elgin, then English ambassador to Turkey. The British Museum obtained them from him in 1816 for about $175,000. The sculptures adorned certain buildings on the Acropolis of Athens, which then was a Turkish fortress. The chief portions, which are from the Parthenon or Temple of Minerva, were designed by the great sculptor Pheidias. At the time of their removal a fierce controversy arose in England as to Lord Elgin's right to take them from Athens. Lord Byron considered their removal very unjust, and his view was shared by many. See Newton's *Contents of the British Museum, Elgin Room.*

Elia. See LAMB, CHARLES.

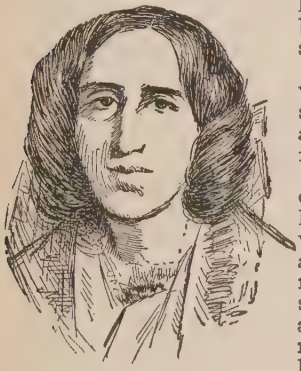
Elias or **Eli'jah,** the greatest of the prophets of Israel, flourished about 900 B. C. The Bible tells how God, through him, imposed a three years' drouth upon the northern kingdom; how he was fed by ravens; how he challenged the pagan priests at Mt. Carmel to bring down fire from heaven to consume their sacrifice; and how he was later taken up to heaven in a chariot of fire. He was an uncompromising upholder of the Hebrew faith against idolatry, especially against the Baal-worship brought from Phœnicia by Jezebel, and saved the purer religion from destruction and corruption. Like Moses and Samuel, he was statesman as well as prophet, ordaining new kings for Israel and Syria and appointing Elisha his prophetic successor. The Jews of later times expected Elijah to return to announce the coming of the Messiah, and the prediction of his return is declared in the New Testament to have been fulfilled in John the Baptist. Elijah also appears with Moses on the Mount of Transfiguration. His story is

a favorite with artists. See *Kings I* and *II* and *Elijah* by Dr. Milligan.

Eliot, Charles William, LL.D. president of Harvard University, was born at Boston, Mass., March 20, 1834, and educated at Harvard. He began his educational career as tutor in mathematics in his *alma mater* and later became professor of chemistry at Harvard and at the Massachusetts Institute of Technology. In 1869 he was chosen president of Harvard, where his influence on educational thought has been great. He resigned in 1908, to take effect in 1909. In conjunction with F. H. Storer he published *Manuals of Qualitative Chemical Analysis* and *Inorganic Chemistry*. He has also published *Educational Reform* and *Five American Contributions to Civilization*

CHARLES W. ELIOT

Eliot, George, the name by which the great English novelist, Marian Evans, is known. She was born in Warwickshire, Nov. 22, 1819. Her father was a man of strong character, and after her mother's death in 1836 Marian took charge of the house. She was well-educated, and was a wide reader. When she was just of age, her father removed to Faleshill Road on the outskirts of Coventry. Here she became acquainted with Charles Bray, the author of several works in philosophy, and formed a close friendship with his wife and her sister and brother, Sarah and Charles Hennell. Through their influence she began to give up her early belief in Christianity. In 1846 she published a translation of the German writer Strauss' *Life of Jesus*, and she later translated other philosophical works. In 1850 she began to write for the *Edinburgh Review*, and next year became its assistant-editor. Her first stories, *Scenes from Clerical Life*, appeared in *Blackwoods' Magazine* in 1857, and at once gave her a wide reputation. Two years later she published *Adam Bede*, which fixed her place among the greatest English novelists. This was followed by *The Mill on the Floss*, *Silas Marner*, *Romola*, *Felix Holt*, *Middlemarch* and *Daniel Deronda*. Of her poetry, *The Spanish Gypsy* and *The Legend of Jubal* are well-known, though they do not rank with her prose-works. As a novelist George Eliot is specially noted for power in describing the growth of character. Her subjects are all representatives of distinct traits of character. Her first husband, the author G. H. Lewes (q.v.), died in 1878. She married John Cross in 1880, but died December 22nd of the same year. See *Life of George Eliot* by J. W. Cross and R. H. Hutton's *Modern Guides of English Thought*.



GEORGE ELIOT

Eliot, John, "the Apostle to the Indians," was born in Hertfordshire, England, in 1604, the son of a yeoman; graduated at Cambridge in 1622; and went to Boston in 1631. In 1646, after two years' study of the Algonquin language, the tongue of the Indians of Massachusetts, he preached a long sermon to the Indians near Roxbury, and other meetings followed. At one time there were over a dozen townships of "praying Indians" in Massachusetts, and many more outside, numbering 3,600. Eliot, with two others, prepared the *Bay Psalm Book*, which appeared in 1640, and was the first book printed in America north of Mexico. He made several translations of English religious books into the Indian tongue, but his greatest work was his Indian Bible. He died at Roxbury, Mass., on May 21, 1690. See *Life* by C. Francis in Sparks' *American Biography*.

Eliot, Sir John, English statesman was born at Port Eliot, England, on April 20, 1592, the son of a country gentleman of Cornwall. While traveling in Europe he met Villiers, afterward Duke of Buckingham. As an adherent of the duke he entered Parliament in 1624. But in the next parliament he broke with him, owing to the refusal of Buckingham—at that time the favorite adviser of King Charles I—to acknowledge the house of commons as the real ruling power in the nation. Eliot became the leader of Parliament against the encroachments of the king on its rights, and this policy at last brought about the impeachment of Buckingham. For this Eliot was imprisoned in the Tower for nine days. In the Parliament of 1628 his voice was raised against taxation by the crown without consulting Parliament, and it was mainly through him that the famous *Petition of Right* was extorted from Charles. He was sent to the Tower in 1629, and died there on Nov. 27, 1632. See *Life* by John Forster.

Eli'sha, a prophet of Israel, the successor of Elijah. He prophesied for 55 years.

Receiving the mantle of his master when he was taken up into heaven, he was recognized by the other prophets as their head, and was held in reverence throughout his whole life by the Israelites. His history is told in the second book of *Kings*.

Eliz'abeth, county-seat of Union County and formerly the capital of New Jersey, is situated five miles from Newark Its trade has access to the sea through Elizabethport, on Staten Island Sound. It is the seat of a large Singer sewing-machine factory, and also has manufactories of oilcloth, mill-machinery, stoves, harness, pottery, ironware, hats, combs, etc. Elizabethport ships large quantities of coal, and here are located the shops of the Central Railroad and the Crescent Steel Works and Shipyard. The city has a business-college, two high-schools and 11 grade-schools. A drawbridge over the sound, 800 feet long, joins New Jersey with Staten Island. Population, 73,409.

Elizabeth, queen of England, was the daughter of Henry VIII and Anne Boleyn, his second wife, and was born in Greenwich Palace Sept. 7, 1533. Her mother was beheaded when she was not yet three years old, and her father married Jane Seymour. Her early years were passed mainly with her governess and teachers, among them Roger Ascham and Sir John Cheke, under whom she learned to read Latin and Greek, to speak French and German with ease and to acquire what little music was then known. Two of her stepmothers, Anne of Cleves and Catherine Parr, were quite friendly to her, and Catherine would have had her much at court had it not been for Henry's dislike to his daughter. But till the death of her sister Mary, when she herself became queen, she had little to do with court or politics. Some of Elizabeth's teachers had been Protestants, and, as she was known to be such herself, Queen Mary suspected her of being concerned in Wyatt's rebellion in 1554, and she was thrown into the Tower. Afterward she was kept strictly guarded in Woodstock, and her worshiping with the Catholics was probably all that saved her from being sent to the block. On the death of Mary on Nov. 17, 1558, Elizabeth, then 25 years old, was summoned to the throne amid the rejoicings of the Protestants and many moderate Catholics. She at once saw that her part in European politics must be that of a Protestant sovereign. The great blots upon her reign are the persecution of the Catholics and the beheading of Mary, Queen of Scots. There is no doubt that Elizabeth was very jealous of Mary's beauty and attractiveness, though she was also prompted to the act by the discovery of designs against her life, such as the Ridolfi plot. The glory of Elizabeth's reign, on the other hand, is the destruction of the Spanish Armada in 1588. When an army gathered at Tilbury for the defense of England, she showed the courage of her race and made a ringing and patriotic speech to her troops, but the real credit for saving the nation is not hers. She was the last to believe that the Armada was really coming, and was so penurious in fitting out and provisioning the navy that she risked defeat and prevented the victory which was won from being as complete as it otherwise would have been. The real credit is due to the skill and courage of the great English captains of the time and to the generous gifts of English merchants. Elizabeth, however, showed both sense and shrewdness in her choice of the ablest men of the kingdom as her ministers. "The golden days of good Queen Bess" form one of the greatest periods of English history — the period when Great Britain became a world-power.

Elizabeth never married, but it was not for want of suitors. Philip of Spain, who had married Mary; Eric, king of Sweden; Henry III of France; Henry of Navarre; and Archduke Charles of Austria were some of her professed admirers. It is curious that more than any of these kingly suitors she liked the duke of Alençon; although, when they first met, she was 38 and he was 19 and a dwarf, with a face horribly disfigured by smallpox. But her heart was most deeply touched by Robert Dudley, Earl of Leicester, master of the horse, handsome and clever, husband of ill-fated Amy Robsart. The next favorite was the equally ill-fated Earl of Essex. But Elizabeth alternately loved and scolded him, seeming to care for him more as a mother cares for a spoiled child. When Essex was beheaded for rebellion, in 1601, she does not seem to have shown much grief. Elizabeth's love of dress is notorious. A German traveler who saw her going to chapel when she was in her sixty-fifth year, says: "She had pearls with rich drops in her ears, wore false red hair, had a small crown on her head, her dress white silk bordered with pearls the size of beans, a collar of gold and jewels." When young, she was noted for her abundance of auburn hair and delicate white hands, but her face and manners were almost masculine Elizabeth died on March 24, 1603. See *Queens of England* by Strickland; Creighton: *Queen Elizabeth;* and Hassall: *The Tudor Dynasty.*

Elizabeth, Pauline Ottilie Luise, queen of Rumania, was born at Neuwied on the Rhine, Dec. 29, 1843. As a writer she is best known by her pen-name, Carmen Sylva, under which she published *Sappho, Storms, Pilgrim Sorrow, Some One Knocks, Hammerstein, Jehovah,* etc. In 1869 she married Prince Charles (King

Carol I) of Rumania, and with her marriage she began to take an enthusiastic interest in Rumania, especially when its independence of Turkey was proclaimed, and it was erected in 1879 into a kingdom. In 1881 she and her consort came to the throne, and in that year she published *Pensées d'une Reine*, and some years later she issued a collection of her lyric poems. In her kingdom she was deemed the mother of her people. She died March 2, 1916.

Elizabeth, Saint, daughter of Andreas II, king of Hungary, was born at Presburg in 1207. When four years old, she was promished in marriage to Louis IV, landgraf of Thuringia, and was brought to his court in the Wartburg, to be raised under the eyes of her future husband's parents. She early became passionately devoted to the Christian life. She despised pomp, and tried to be humble, and was most self-denying in her gifts to the poor. The marriage took place when she was but 14, and six years later Louis died as a crusader, while at Otranto. Great misfortunes soon befell the saintly landgravine. She was deprived of her regency by her husband's brother, and driven out of her kingdom on the ground that she wasted the state-treasures by her charities. At last she found refuge in a church, where her first care was to thank God that He had found her worthy to suffer. After other trials, such as being forced to take up her abode in the stable of an inn, she was received into a monastery by the abbess, who was her aunt. When the warriors who had gone with her husband on the crusade came back from the east, she gathered them around her and recounted her sufferings. Steps were at once taken to give her back her rights, but she refused again to be regent and would only take the revenues that belonged to her as landgravine. She was allowed to go back to her castle at Marburg, but in her humility she lived in a cottage at the foot of the hill on which it stood, donning the nun's dress and spending all her life and all that she had in relief of the poor, earning with her own hands what little she needed for herself. She died on Nov. 19, 1231, and four years later was added to the number of the saints by Pope Gregory I. For ages her shrine was one of the most famous in Europe, and the altar-steps before it are worn hollow by the knees of pilgrims. Even during her life many miracles were connected with her name. The best-known story is that of the basket of roses. Against her husband's command she carried a basket of food to a poor family. On the way she met her husband, who sternly ordered the basket to be opened. Frightened and trembling, she obeyed, only to find in answer to her prayer the basket filled with beautiful roses. See Kingsley's *Saints' Tragedy*.

Elk or **Moose,** the largest living deer common to the Old and New World in northern regions. In the New World it is found mostly in northern Maine and British North America. It has long legs, standing about six feet high, a large head with broad muzzle and large nostrils, but can be distinguished from all other deer by the horns or antlers of the male, each of which is in two parts, like a broad hand with the palm curved and held upward; around the margins are prongs or snags. An average full-grown pair, with the skull, weighs 70 pounds. They grow gradually; the first year being only knobs an inch high, the second year they are about a foot long, and the third year are palm-shaped. The fully formed horns are shed in December, and sprout again in April, reaching their full size in June. It is remarkable to think of these enormous horns being shed annually and produced again in so short a time. The moose feeds on willow-tips, the tender shoots of the striped maple and other trees, bark and various evergreens Moose are rapid runners, and, having sharp senses of hearing and smell, are difficult to hunt. In winter they herd in small troops for protection. Remains of an extinct elk of gigantic size are found in the peat-bogs of Ireland. This Irish elk held its antlers ten feet high, and they measured 11 or 12 feet from tip to tip. In America the wapiti is often wrongly called the American elk. See Edward's *Campfires of a Naturalist*.

HEAD OF ELK

Elkhart, Ind., a city of central northern Indiana, capital of Elkhart County, 20 miles east of South Bend and 100 east of Chicago. It lies at the confluence of the St. Joseph and Elkhart Rivers, and is the junction of a number of railroads. These advantages make it a good shipping-point and attractive manufacturing city. The town was founded early in the thirties, and incorporated in 1875. Here are located the locomotive-shops of the Lake Shore Railroad, foundries, planing-mills and factories. Among its manufactories are paper-mills, carriage and musical-instrument establishments, the largest band-instrument factory in the world being here. The city has 30 churches and ten schools, and is a modern, progressive, business city. Population, 19,282.

Elkins, Stephen Benton, American politician, was born in Perry County, Ohio,

Sept. 26, 1841, and was educated in Missouri, where he began the practice of law. In 1863 he settled for a time in New Mexico and became member of the territorial legislature, attorney-general, United States district-attorney and delegate in Congress from New Mexico. He subsequently removed to West Virginia and became interested in railroads and in coal-mining. He was appointed secretary of war in the Republican administration of President Harrison, and later became United States senator from his state of West Virginia.

Ellice (*ĕl'lĭs*) or **Lagoon Islands, The,** were discovered by Capt. Peyster, an American, in 1819. They lie north of Fiji. The principal islets include Sophia (Rocky) Island and the Nukulaelae (Mitchell) group. The entire group has a population of 2,400 on 14 square miles of land. It is under the jurisdiction of the high-commissioner for the western Pacific, whose headquarters are in Fiji.

Elm (genus *Ulmus*), an important tree of temperate climes. The English elm is one

WHITE ELM

of the chief timber-trees of the British Isles and is highly valued for its beauty. Comparing it with the American elm, it is a stockier tree and of less grace. The American or white elm is a tree dear to all familiar with New England, and is famous in our history. Every schoolboy has read of the Washington elm at Cambridge, Massachusetts, under which Washington stood when he took command of the American army, and of the elm under which William Penn made treaty with the Indians. It is a magnificent tree, sometimes towering 125 feet, its height and its great, arching limbs presenting a most stately and graceful appearance. In New England the long arms reach quite across the wide roadway. The New England elms veritably are a race of giants. The bark is gray and rough; the leaves, from two to six inches long, are alternate, obovate, and make pleasant but not too heavy foliage; the flowers, inconspicuous and greenish red, appear in March; the fruit is small, winged, green seeds. The tree is of rapid growth, its distribution being from Newfoundland to Florida and west to the Rocky Mountains. A great pity is the troop of insect-destroyers that are doing their best to lower the pride of the stately tree; the tussock-moth, elm-beetle and brown-tail greatly marring its beauty.

The slippery elm is a tree beloved of the "chewer," who, by the way, works it much harm in his effort to get at the fragrant inner bark, the cambium that in the spring is so inviting and refreshing. Druggist as well as small boy appreciates its virtues, keeping on his shelf various preparations made therefrom. The slippery elm, moose or red elm, is a quick-growing tree, rises 60 to 70 feet, and has a broad, flat head and spreading branches; the bark is rough and reddish-brown; the leaves are alternate, broadly oval, and from four to seven inches long. The tree grows fast and vigorously when not too ruthlessly attacked, but is becoming scarce.

The rock, cork or hickory elm has the typical elm-leaf but not the characteristic grace of the family. It has a corky bark, bears flowers and fruit in racemes; grows from 60 to 90 feet high, and has a round-topped head and stiff branches. The wood is hard and highly valued by the wheelwright. This elm thrives in lower Ontario and Michigan, and is found in scattered localities from Vermont to Tennessee and west to Nebraska. See Rogers: *The Tree Book;* Lounsberry: *A Guide to the Trees.*

Ellora, a village of Hindustan, celebrated for its wonderful rock-hewn temples. Of these there are 34 of a large size. Some are cave-temples proper, that is, chambers cut out inside of the rock; but others are buildings hewn out of the solid granite of the hills, having an outside as well as an inside architecture. In cutting the latter, a deep trench or pit is dug around a square, leaving a central mass standing, which is then hewn and excavated into a temple. The Hindu temple called the *Kailas,* is the most beautiful of all. It forms a pyramid, and is overlaid with sculpture. It is believed that the caves date from the seventh century.

Elmi'ra, New York, the county-seat of Chemung County, is on Chemung River, 149 miles from Buffalo. It has manufactories of iron-rails, railroad-cars, carriages, flour, leather, woolens, boots and shoes, steel-plate works, glass-works, rolling-mills, steel-bridge works, hard-wood finishing-works, etc. The city is in a fertile region, and there are stone-quarries in its vicinity. Here are located Elmira College, a state-armory, Arnot-Ogden Memorial Hospital, Steele Memorial Free Library, a government-building and various charitable institutions. Elmira has a fine park-system and all the adjuncts of the modern city. Population, 37,176.

El Paso, Texas, the county-seat of El Paso County and the northwestern gateway into Mexico, is situated on the Rio Grande River, on the southern boundary of New Mexico. Five of the great lines of railway-travel center here, but connect with the Pacific coast and the Mexican capital. The city has a high elevation and a mean annual temperature of 63° F. Near by are extensive salt-deposits as well as minerals. The United States government maintains a military post here. The population, which is a mixed one, including a number of Mexicans, Indian half-breeds, etc., numbers 39,279.

Elves. See FAIRIES.

Elwood, Ind., a rapidly growing town in Madison County, central Indiana, 40 miles northeast of Indianapolis, is on the Lake Erie and Western and other railroads. It is a shipping point for grain and live-stock, and has a rapidly developing trade. Its manufacturing industries include saw and stave-mills, flax-factories and establishments for the manufacture of window, plate-glass and lamp-chimneys, flour and tin-plate mills, etc. It is surrounded by an agricultural region, and is in a natural-gas belt. The population within the past 20 years has risen from 2,284 to 11,028.

Ely, a town in Cambridgeshire, England. Here, in 673, Saint Etheldreda founded a mixed monastery, which, burned in 870 by the Danes, was refounded in 970 as a Benedictine abbey. In 1083 the first Norman abbot laid the foundation of the present church, which was made a cathedral in 1109, and, as we see it to-day, is one of the finest shrines in Christendom. Built in the form of a cross, it offers examples of all styles of Gothic architecture and is a growth of more than four centuries. Population of Ely, 9,000.

Ely, Richard Theodore, an American professor of political economy, was born in April, 1854, and studied at Columbia University and at Heidelberg. He was professor at Johns Hopkins from 1881, and at Wisconsin from 1892. Professor Ely believes in public ownership of such utilities as the telegraph and railway systems. While not a socialist, he is friendly to labor, and was even accused in 1894 of aiding a strike, but was acquitted. He is the author of several books, the latest and largest being his *Distribution of Wealth.* Others are *French and German Socialism in Modern Times, Socialism and Social Reform* and *Social Aspects of Christianity.*

Elyria, Ohio, a county-seat of Lorain County, 25 miles from Cleveland. The surrounding country is agricultural, but in the vicinity there are sandstone-quarries, which provide employment for many people. Among the industries are the manufacture of iron and steel-products, automobile-supplies, saddles, bicycles, etc. Population, 14,825.

Eman'cipa'tion Proclamation. After the Civil War had been in progress for more than a year, the antislavery leaders in the north urged President Lincoln to take action toward the abolition of slavery. While personally opposed to slavery, the president was slow to take so important a step until it should appear to be necessary in order to save the Union. Replying to the suggestions, he said, on Aug. 22, 1862: "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing any slave, I would do it; if I could save it by freeing all the slaves, I would do it; and if I could save it by freeing some and leaving others alone, I would do that." At length it became evident that slavery was a source of military strength to the Confederate cause, since slave-labor provided the means of supporting the Confederate forces in the field, and that it must be destroyed if the Union was to live. Accordingly, on Sept. 22, 1862, the president issued a preliminary proclamation, giving notice that on the 1st of January, 1863, "all persons held as slaves in any state, the people whereof shall then be in rebellion against the United States, shall be then, thenceforward and forever free." No attention was paid to this notification, and on the first day of January, 1863, President Lincoln issued the final proclamation of emancipation, declaring free all persons held as slaves in the states then in rebellion. This proclamation was given effect as fast as territory came under Federal control.

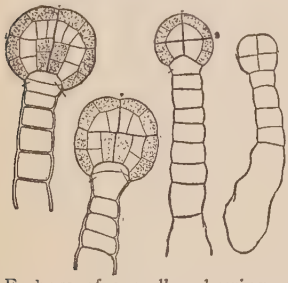
Eman'uel I, king of Portugal, called the Great or the Fortunate, was born on May 3, 1469, and became king in 1495. His reign is known as the golden age of Portugal. He prepared the code of laws which bears his name, and made his court a center of chivalry, art and science. Vasco da Gama's voyage round the Cape of Good Hope, Cabral's discovery of Brazil and the expeditions of Albuquerque and others, that so widened Portuguese possessions, were all sent out and encouraged by Emanuel. It was he that made Portugal the first naval power of the world as well as its great commercial center. He died at Lisbon on Dec. 13, 1521.

Embalming. See MUMMY.

Embar'go-Acts are orders to restrain the ships either of a foreign nation with whom war has been declared or of the home nation from leaving port. An embargo-act was passed in the United States in 1794. This act was the answer to the British orders-in-council of 1793. France and England had each tried to cripple the other by declaring in turn that neutral vessels carrying to either were the lawful

prize of the other. The United States had too weak a fleet to declare war, and, therefore, tried to bring the two powers to terms by preventing her own vessels from trade. The southern party, chiefly agricultural, was in power, and their action crippled New England, which was so hard hit by its loss of trade that it threatened to secede. A stricter embargo-act was passed in 1807. Exports fell from $110,084,207 in 1807 to $22,430,960 in 1808. The American carrying-trade has never since fully recovered. England, the chief offender in seizing American ships and pressing American sailors (for France did not command the sea), alone profited by the American embargoes. In 1809 the embargo was removed, but in its stead a non-intercourse act was passed against trade with France or England. War broke out with England in 1812. A new embargo was levied until 1814. In spite of the opinion of Jefferson, it seems clear that the embargoes injured the home country more than her enemies, and thus were unsound.

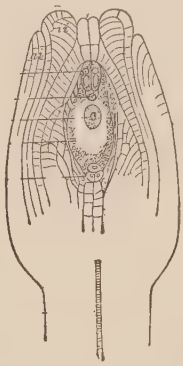
Em'bryo (in plants), a plant in the earliest stages of its development. In *Spermatophytes* the name is restricted to the development within the seed. Taking the bean embryo as an illustration, it consists of a small stem, once called the caulicle, but now known as the hypocotyl, from the lower end of which the root develops, and at the upper end two large and fleshy leaves appear (the halves of the bean), called the cotyledons. Between the cotyledons a little bud is apparent, called the plumule, in which the subsequent leaves are more or less formed, and which is to develop into the shoot when the embryo escapes from the seed. Such an embryo represents the common form among the dicotyledons. Among the monocotyledons, as in corn, the same parts appear, but the single large cotyledon is terminal on the hypocotyl, and the stem tip comes out at one side. Among the conifers, as in pines, a rosette of cotyledons may appear, in the center of which is the plumule. In the development of the embryos of seed-plants a temporary organ, called the suspensor, usually appears. It generally is a more or less elongated filament of cells, which at its tip bears the cell which is to form the real embryo, and by its growth places this cell in a better position in reference to the food-supply which is forming in the seed. JOHN M. COULTER.



Embryo of capsella, showing superior (below) and embryo (above) in various stages of development

Embryology. See DEVELOPMENT.

Em'bryo-Sac (in plants). In the ovule of angiosperms there is developed what appears to be a large cavity, but is really a single large spore which is not discharged (see MEGASPORE). This spore germinates and develops within itself a very simple gametophyte consisting of seven cells (see GAMETOPHYTE). This spore containing its gametophyte, before it was known to be a spore, was called the embryo-sac, because the embryo was observed to develop within it. At one end of the sac three of the seven cells are grouped together, the group being called the egg-apparatus, since the central cell is the egg, which is to produce the embryo, and the other two aid it in the process of fertilization. At the opposite end of the sac is another group of three cells known as the antipodal cells. Usually they disappear very soon after they are formed. In the central region of the sac a very large cell appears, called the definitive nucleus or endosperm nucleus. It is this cell which produces the endosperm or food-cells for the use of the embryo. In many seeds, as corn and wheat, it is the endosperm which supplies the food-material used by man



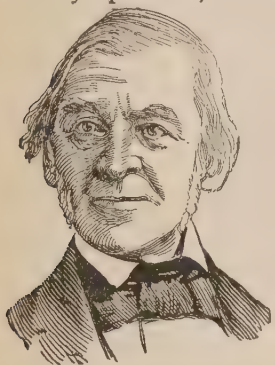
SECTION OF OVULE

Emerald, a mineral differing in nothing but color from beryl The emerald is highly esteemed as a gem. It owes its value mainly to its very beautiful velvety-green color. It is found in very few places. The finest have long been brought from Colombia, where they are got from veins in slate and granite. Valuable stones also come from the upper Orinoco in Venezuela. Poor stones are found in Europe, in Salzburg and the Ural Mountains, and some old mines in Egypt yield them. The gem was known and highly prized in early times. Ptolemy offered a famous poet, who visited his court, an emerald set in gold, with his portrait engraved on it. Nero, who was near-sighted, looked at the combats of gladiators through an eyeglass of emerald. An emerald is rarely without a flaw, and its value depends on its color. A very perfect emerald of six carats has been sold for $5,000. The name of oriental emerald is often given to a very rare, beautiful and precious green sapphire.

Emer'gence (in plants), outgrowths from the surface of a plant, such as warts, prickles, etc., which involve in their origin

the cortex as well as the epidermis. For example, the stem-prickles of the rose are emergences. A contrasting term is trichome, which is applied to structures derived entirely from the epidermis, as ordinary hairs.

Em'erson. Ralph Waldo, a great American essayist, was born at Boston, on May 25, 1803, and graduated at Harvard College in 1821. He studied theology under the direction of Channing, and became pastor of the Second Unitarian Church of Boston. A difference of religious views between Emerson and his congregation brought about a friendly separation, and the remainder of his life was spent as a lecturer and writer. In 1833 he made a first visit to Europe, of which he has given an account in his *English Traits*. The next year he moved to Concord, and lived first in the house afterward occupied by Hawthorne and celebrated in one of his stories as the Old Manse. It was also in the year (1834) that he began to correspond with Carlyle, whom he had sought out and talked with when in England. This correspondence, lasting from 1834 to 1872, has been published, and shows the two men with all their differences, yet with many deep sympathies. In 1836 appeared *Nature*, a poetical rhapsody in prose, and though much admired by a small circle of readers, it took twelve years to sell 500 copies. But his oration on *The American Scholar*, delivered at Harvard, attracted the widest attention, as did also his oration delivered at Harvard Divinity School in 1838. Of these writings Oliver Wendell Holmes remarks: "Whosoever has read carefully and lovingly these three essays, *Nature*, *The American Scholar* and the *Divinity School Address*, can almost say of Emerson what he makes the sphinx say of herself:



RALPH W. EMERSON

> Who telleth me of my meanings
> Is master of all I am.

Representative Men, *The Conduct of Life* and *Society and Solitude* are others of his best known books. Emerson died at Concord, Mass., April 27, 1882. Matthew Arnold declared that if Emerson had only had the power of sustaining himself at the sublime heights he sometimes reached, he would have ranked among the world's great poets. He is the friend of all who would live in the spirit. See *Ralph Waldo Emerson*, by Holmes, in the series of the American Men of Letters.

Em'ery, a mineral belonging to the same class as ruby, sapphire and other precious stones. In outward appearance emery has nothing in common with the precious stones to which it is related. It is a dense, opaque, dull, bluish-black substance, like a fine-grained iron-ore. It is found in large, bowlder-like masses on Naxos and some of the other islands of the Grecian archipelago. It is made ready for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness. Emery-powder, as it is next in hardness to diamond-dust and crystalline corundum, is used for cutting and polishing many kinds of stone. Glass stoppers of all kinds are ground into their fittings with it. Plate-glass is ground flat by its means. When used for polishing metals, it has to be spread on some kind of surface to form a fine file. Emery-paper, emery-cloth, emery-sticks, emery-cake and emery-stone are used for this purpose. Emery-wheels are largely used for polishing iron-castings. They are a mixture of emery-powder and hard, vulcanized india-rubber.

Emigra'tion means going out of one country into another, and generally to a far-away part of the world. In the country which people leave they are generally called emigrants or wanderers out; in that in which they settle they are usually styled immigrants. Jacob and his family were immigrants into Egypt, and their descendants became emigrants from that country when they went to inherit the promised land. Among the main causes which have led to emigration at different times are the pursuit of wealth, the pressure of over-population at home and discontent, political, social or religious. The Spaniards came to America to get gold. Many of the Greeks in old times emigrated because of over-population. Political and social discontent accounts in great measure for the large numbers of Irish emigrants. Forced service in the army is one great cause of German emigration. Religious persecution led to the emigration of the Huguenots from France to England and of the Puritans from England to North America. At the end of the 15th century the opening of the passage to India round the Cape of Good Hope by Vasco da Gama and the discovery of America by Columbus at once brought to the eyes of Europeans new lands, and then modern emigration began. The Spaniards left their motherland to go to the West Indies and to Central and South America; the Portuguese to Brazil, the East Indies, India and Ceylon; the Dutch to the East and West Indies, Guiana, New York and the Cape of Good Hope; the French to Mauritius and Bourbon, the West Indies, Louisiana, India and Canada; the English to the West Indies, North America and, later, to India, Australia and

South Africa. European emigration has been greatest since the 19th century, because the population has increased so enormously. Europeans are naturally attracted to countries of like climate, which have not already an over-large population and in which the chances of gaining wealth are good. For these reasons the greatest emigration has been to the United States, Australia, South Africa and the temperate parts of South America, for example, the Argentine Republic.

Emin Pasha or **Bey,** proper name **Eduard Schnitzer,** was born at Oppeln, Silesia, in 1840. He studied medicine, and in 1864 went to Turkey, where he became a well-known physician. He learned to speak Turkish and Arabic easily, and adopted Turkish habits and customs. He also adopted the name Emin, which means the faithful one. In 1876 he joined the Egyptian service, and proceeded as chief physician to the equatorial province, of which he was made governor in 1878 by "Chinese" Gordon. Here the sudden rising of the Mahdi shut him up and out of the world. The expedition sent under Stanley for his rescue reached him in May, 1888. In 1890 he entered the German service and at once made his way again to Central Africa. He was, however, killed in 1892 by Arabs near Nyangwe. See Stanley's *In Darkest Africa.*

Em'met, Robert, an ill-fated Irish patriot, was born at Dublin in 1778. At fifteen he entered Trinity College, where Moore, the poet, was his fellow-student, but soon left to join the United Irishmen. He next traveled in Europe, talked with Napoleon and Talleyrand in 1802 on behalf of the Irish cause, and came back the next year to expend $15,000 of his own fortune for muskets and pikes. With a small band he designed a plot to seize Dublin Castle and make a prisoner of the viceroy. The rising utterly failed, and Emmet, who had clothed himself for the occasion in a green coat, white breeches and cocked hat, saw nothing result from the enterprise but a few ruffianly murders. He escaped, but coming back for a last leave-taking from his sweetheart, Sarah Curran, the daughter of the great Irish orator, he was arrested, put on trial Sept. 20, 1803, condemned to death, and hanged on the following day. Just before receiving sentence he made a speech which still thrills the reader by its noble and pathetic eloquence. See Madden's *Lives of the United Irishmen.*

Empo'ria, county-seat of Lyon County, Kan., 60 miles southwest of Topeka. It is a trade-center for a large farming and stock-raising section, and has implement factories, corrugated metal and marble-works, flour and grist-mills. Emporia has 20 churches, 3 libraries, a training school and a business college. A State Normal School, the College of Emporia, the Emporia School of Music and Art, and the Cravens School of Music are located there. It is a division point on the A. T. & S. F. railroad, is on an M. K. & T. branch line, and has the second largest stock-yards on the Santa Fe system. It was founded in 1856 and incorporated in 1870. Population, 9,058.

Ems or **Bad-Ems,** a bathing resort known to the Romans and famous in Germany as early as the 14th century. It is on the River Lahn, ten miles from Coblenz. Its warm mineral springs contain soda. The temperature of the different springs varies from 80° to 135° F. Population, about 7,500.

Emu, a running bird of Australia, closely related to the cassowary. The emu lives on the plains, the cassowary only in the forest and dense scrub. The emus have no cap or helmet like the cassowaries. The head and neck are not bare as in the cassowaries, but are provided with feathers. The plumage is heavy and dull-brown in color. The wing-rudiments are very small. The bird stands about five feet high. Its food is exclusively vegetable, consisting of fruits, roots and herbage. It may be tamed, and breeds easily in captivity. It lays six or seven dark-green eggs, nearly as large as ostrich-eggs, in a cavity scooped in the earth, usually in sandy soil.

EMU

Ency'clopæ'dia, meaning general instruction, is a work professing to give information in regard to the whole circle of human knowledge or in regard to everything in some division of it. The older encyclopædias attempted to give everything then known on all subjects; but, as knowledge has increased, it has become more and more necessary, in order to say something about everything, to be content not to say everything about anything. The great Latin collections of Terentius Varro, dating from 30 B. C., and the *Natural History* of Pliny the Elder are the first works which can in any sense be called encyclopædias. In the 10th century the Arabian, Farabi, wrote an encyclopædia remarkable for the time. Vincent of Beauvais, under the patronage of Louis IX of France, gathered together the whole knowledge of the middle ages. The first modern English work of the kind was the anonymous *Universal, Historical, Geographical, Chronological and Classical Dictionary,* which appeared in 1803. The *Cyclopædia* of Ephraim Chambers, in 1728, was the first to use cross-references. It was a French translation of this work which

Diderot used in making the famous *Encyclopédie*, which became the organ of the most advanced and revolutionary thought of the time, and gave a name, the *Encyclopedists*, to a party of philosophers and politicians. The great *Encyclopædia Britannica* first appeared at Edinburgh in 1768-71, and has since gone through many editions. Other popular encyclopedias are Charles Knight's *Penny Cyclopædia* and *Chambers' New Encyclopædia*. Of American works may be mentioned *The Americana*, the *New International* and the *Universal Cyclopædia*.

En'dicott, John, colonial governor of Massachusetts, was born in 1589, at Dorchester, England, and landed as manager of the plantation of Naumkeag (Salem) in 1628. In 1630 London's Plantation became a part of the government of New England, and Endicott gave place to John Winthrop as governor. Six years later he headed a bloody but useless expedition against the Block Island and Pequot Indians. Except for five years, he was deputy-governor or governor of the Massachusetts colony from 1641 to 1665. Endicott was a zealous Puritan, high-tempered, kind and brave. He manifested some personal peculiarities: He cut out the cross from the military standard, had four Quakers put to death, forced the women to wear veils at public assemblies and was opposed to long hair. He died at Boston, March 15, 1665.

En'dosperm (in plants). A food-tissue within the embryo-sac (which see) of seed-plants and used by the embryo. It makes up the bulk of many seeds, as in pines and the cereals, and contains stored food of various kinds, prominent among which is starch. It is sometimes soft and mealy, and in other cases it is horny. In the so-called vegetable ivory it is as hard as the name suggests. An obsolete name for it is albumen. In the alternation of generations (which see) it is a gametophyte, and being associated with the egg it evidently is a female gametophyte. See SEED.

Endym'ion, in Greek myth, a youth famous for his beauty and never-ending sleep. As he slept on Mt. Latmos in Caria, his beauty warmed the cold heart of Selene (the moon) who came down to kiss him and to lie by his side. It was said that Selene had sent him to sleep that she might kiss him without his knowing. On this story Keats wrote his well-known poem *Endymion*.

Enfield Rifle. See RIFLE.

Engine. See STEAM-ENGINE.

Engineering, the work of constructing, designing or operating machines or other structures or equipment having for their aim the economic and scientific utilization of the various forces and resources of nature for the purposes of man. Originally engineering could be classified under the two main headings of civil and military engineering, but modern developments have been so great as to bring into prominence many different forms, such as mechanical, mining, electrical, chemical and sanitary engineering, leaving the term civil engineering to such phases, exclusive of strictly military and marine work, as are not included under these special headings. The old distinction between the civil and military engineer is rapidly disappearing.

The work of engineers is in connection with such things as canals, harbors, bridges, railways, mining and metallurgical plants, factories, sewage-systems, city water-works, lighting and power-plants, machines of various kinds, submarine boats etc. In fact the services of the engineer are required in nearly all modern industrial, municipal and military operations which are to be economically, methodically and scientifically carried out on an extensive scale. All of the discoveries and laws of science and mathematics are here practically applied and utilized for the improvement of man's material wellbeing so far as the ingenuity of the engineer will permit. Thus the utilization by modern engineers of steam-power discovered by Watt now enables one man to do as much work as formerly required thirteen or fourteen hundred men.

The military engineer in the field has to see to such things as the overcoming of obstructions to the marching or transportation of troops, military surveys, construction of maps, selection of camping-grounds, communication, field-fortifications, methods of siege etc. The term ordnance-engineer is often given to those officers whose work consists in designing or constructing cannon or firearms. Engineers of all kinds are now employed in connection with military and naval works, but they are not usually called military engineers unless given a military commission.

The preliminary training for engineers is given in the various technical schools, but one can scarcely hope to be entrusted with important engineering works until he has had several years of practical experience. For the degree of C. E. or M.E. most engineering schools of repute require four years of undergraduate work, about three years of successful experience and one year of graduate work. The four-year courses for the most part aim to give a thorough grounding in mathematics and physics, with special reference to the various forms and applications of power, the strength and qualities of the ordinary materials used in construction, freehand and mechanical drawing and the use of the common engineering instruments. A considerable amount of time is also expected to be spent in practical shopwork.

As the work of the engineer requires a considerable amount of maturity and ability to secure a firm, accurate grasp of fundamental relations, it is best that one

should have a good general education before entering upon an engineering course. In the meantime much help can be gained from the different magazines dealing with engineering and scientific subjects, as the *Scientific American* and the accounts of the proceedings of the engineering societies of which there are many in the United States, national, international and local.

The opportunities at the present time for the skillful and reliable engineer are excellent, particularly if one has ability as an administrator. It will become more and more desirable in future for the railroad-president, the factory-superintendent, the mine-manager etc., to have a knowledge of the technical side of his work, and such positions will more and more demand technically trained men. In the field of construction, while, comparatively speaking, the great bulk of railroad-track has already been laid, much work yet remains to be done in the building of branch-lines, cutting down grades, improving track-beds and in the solution of the growing problems of city-transportation, sanitation and farm-irrigation. In the fields of chemical and electrical engineering, the possibilities are simply unlimited. A single new discovery or invention might lead to a complete revolution of our industrial life. For instance: the discovery of a cheap means of separating aluminium from clay might lead to a discarding of the use of iron for a great many purposes; or the perfection of an electric storage-battery might do away with the use of steam-power almost entirely. Even the problem of aerial navigation may soon come to engage the serious attention of the sober-minded engineer.

The prospective engineer can make no mistake in taking time and patience to learn in detail the practical workings of his own particular line from the ground up. As to financial returns, the engineer is more fortunate than the doctor or the lawyer in that he is usually able to command a fair salary for his work from the outset, while the ultimate returns of his mature labor may be very large. The qualities most essential to the success of the engineer are energy, practical judgment and a painstaking, accurate temperament. Early indications of engineering ability may be shown by fondness for mechanical contrivances and by interest in the practical side of scientific and mathematical studies.

Eng'land, is the southern, largest and far the most populous portion of Great Britain. In shape it forms an irregular triangle, of which the eastern side measures in a straight line 350 miles, the southern 325 miles, the western 425; but its shores are so deeply cut by bays as to make the coast-line longer in proportion to the size of the land than in any other country save Scotland and Greece. England has for hundreds of years been one of the leading powers of Europe, but her area is small. England without Wales, covers 50,222 square miles, about the size of Rumania, less than a fourth of France or Germany, and but little larger than New York state. Twenty-nine states are each larger than England; several indeed are larger than the entire United Kingdom. England owes her name to the Engles or Angles, who, with the kindred Jutes and Saxons, conquered the greater part of what had been known as Albion or Britain. England's climate is milder on the whole than that of any region as far north. The northwest is mountainous and hilly, the east and south mainly a plain crossed by lines of low hills. It is much more fertile than Scotland or Ireland, for 80 per cent. of its area is productive. It is very rich in coal and iron. The English are made up of many races. A non-Aryan race, perhaps Euskarian, inhabited the country before the Celts, who conquered them and intermarried with them. The Roman armies brought settlers with them —Gauls, Germans, Iberians, Italians, Dacians, Phrygians and the other races which made up the legions of the empire. Then came the Angles, Saxons and Jutes, followed by the Danes and Norman-French. Out of these various stocks a well-marked race has been formed, self-reliant, prompt to defend its rights, daring, hard-working and ambitious, which has given its language and, in part, its institutions to 250,000,000 of the world's people. England became the headquarters of machine-making of all kinds, of steam-power, of commerce, navigation and shipping; but she was not the first of European states to start in the race of commerce. Long after France, Flanders and parts of Germany were great manufacturing centers, England was a farming and wool-producing country. Agriculture was at its height in the reign of George II, when the agricultural wealth of the United Kingdom was $2,905,000,000, and made up half the wealth of the nation. At present (1911) the yearly imports of the United Kingdom are over $3,400,000,000, in order of value as follows: Grain, including potatoes, raw cotton, manufactures, meat, wool, sugar, dairy-products, tea and coffee, timber, minerals, wines and spirits, flax and jute, raw silk. The yearly exports reach over $2,700,000,000, in order of value: Cotton-goods, iron, woolen-goods, machinery, coal, linen, jute goods, metals other than iron, cutlery, silken goods. The shipping of the United Kingdom is 42 per cent. of that of the world, while its wealth is put down at $46,140,000,000.

Cæsar's raid into Britannia, in 55 B. C., was followed by the Roman conquest; but the history of England does not properly begin till the 5th century, when the Teutonic tribes which have given the nation

GREAT BRITAIN'S KING AND QUEEN

This picture was taken at the wedding of the Kaiser's only daughter, Princess Victoria Louise, to Prince Ernest of Cumberland. The King, in honor of the occasion, is dressed in the uniform of a German cuirassier. The Queen's dress is of cloth of gold with a long train. Her majesty wore a diamond tiara and ropes of magnificent diamonds round the neck, with a diamond pendant composed of two enormous stones.

its name gained a foothold on the island. Before 600 A. D., Saxons and Angles had made settlements as far north as the Forth, and the many princedoms had merged into the two rival powers, Northumbria and Kent, while a third, destined to devour the other two, was Wessex to the south. Long before England became one nation, its people were united by belonging to a single Christian church. The marriage of the king of Kent with a Frankish princess gave an opportunity for Augustine and his fellow-missionaries to land in 596; and the marriage of a Kentish princess with Edwin of Northumbria carried Christianity from Canterbury to York. In 802 Egbert, who had learned at the court of Charlemagne how to conquer, became king of Wessex, and brought all England under his power as far north as the Dee. The Danes, as robbers, then as settlers and lastly as conquerors, harried the Saxons for 200 years after the death of Egbert. Alfred, by surrendering the north and east of England to be held as vassals of the Saxon king, secured the supremacy of Wessex. The reign of Edgar the Peaceful and the government of his great minister, Dunstan, closed the period of Saxon greatness. By 1012 the Danes had triumphed, and Sweyn, the leader of the invaders, was in fact king of England. Under his son, Canute, England was in some respects the head of a Scandinavian empire. But his two sons were weak, and with the aid of Godwin, the powerful earl of Wessex, Edward the Confessor re-established the Saxon line. On the death of Edward, Godwin's son Harold was recognized as the ablest man in the kingdom, and was chosen king. His banished brother, Tostig, was defeated at Stamford Bridge, but three days later Harold was himself defeated and slain in the battle of Senlac, near Hastings, by William the Conqueror, Oct. 14, 1066. With William began England's connection with the continent and the bringing in of feudalism. The Norman kings, when their time was not taken up by foreign wars, were occupied by strengthening against the nobles and the church the powerful monarchy founded by William.

Though the enormous power wielded by the Norman line was of great use to the nation in checking the barons, who were the oppressors of the serfs, its evils were seen when it came into the hands of boastful, tyrannical and weak King John. Disgraced in the eyes of all England by his allowing himself to be stripped of all his French possessions and by being excommunicated and deposed by the pope, the nobility appeared as the true leaders of the nation and wrung from the humbled king that great charter which secured the foundations of the future liberty of England. To make the charter a reality and secure the orderly growth of these liberties was the work of the great King Edward I. The attempt of Henry III to disregard *Magna Charta* caused the successful rebellion headed by Simon de Montfort. But in the reign of Edward I a parliament assembled (1295), and the principle that where all were concerned all should have a voice was acknowledged. Great powers were left to the king, but Parliament was armed with the right to tax, and steadily increased its grip on affairs till, at the close of Edward III's reign, it could impeach the ministry. Richard II's unwise claim to the sole power of the crown brought on the revolution that closed the struggle, and Henry IV came to the throne as the choice of Parliament, while the council named by Parliament became, in fact, a body of national ministers. Edward I died before he had finished the conquest of Scotland, and his weaker son, Edward II, had been badly defeated by the Scots at Bannockburn. Edward III's attempts to make himself king of France were mere raids of no lasting value, except so far as the life of the peasant-soldier helped to free the lower orders from serfdom. The French wars of Henry V were much more successful than those of Edward III, and the union of the two kingdoms seemed to be promised when the great king died. The manhood of Henry VI ushered in the Wars of the Roses between the two branches of the Plantagenets, the houses of Lancaster and York. The Yorkists won, and the powerful and despotic Edward IV ruled with a strong hand, and Parliament in his reign had little power. But his successor, Richard III, made himself hated by all classes of the people, and the battle of Bosworth put on the throne Henry VII, the first of the Tudors, who acknowledged that he was king by the will of the people. In Henry VIII determination to have his own will was blended with a real desire for the well-being of his people. Driven by his passion for Anne Boleyn, Henry demanded a divorce from his Spanish wife, and the opposition of the pope brought to a crisis in England the Reformation, which had been smouldering since the days of Wiclif. But Henry's zeal as a reformer overshot the mark, and it was with a general feeling in her favor that Mary the champion of the old faith, ascended the throne. Unfortunately, she allied herself too closely to Spain, and it seemed likely that England might become a Spanish dependency. So when Elizabeth came to the throne, Protestantism and national independence were linked together as one cause; and she, as well as Mary, was at first supported by the bulk of the nation. Her great minister, Lord William Cecil, played such an able part that, without openly defying the great Catholic powers, she came to be looked to at home and abroad as the

champion of Protestantism; and the strength of the nation was built up till it could drive from the coasts of England the Spanish Armada.

On the death of the queen the crown passed to the Scottish king. James I came to the throne more by right of inheritance than by choice of Parliament. His title was declared to be by divine right, as it was then called, but he was used to Scotch, not to English, ideas of the rights of the crown. The rights of Parliament had been decided when the house of Lancaster was on the throne, but now had to be fought for all over with the house of Stuart. The struggle came to a head under Charles I, from whom was forced the great Petition of Right. Then followed the Civil War and the trial and execution of Charles. But Parliament now found itself mastered by the overwhelming ability of Oliver Cromwell, who had been brought to the front as a successful general in the war. He succeeded in raising England to a high place among nations, but on his death and the prospect of a succession of military tyrannies Charles II was asked to be king. At once the struggle between king and Parliament began again; and, though Charles died seemingly triumphant, the want of judgment, little short of blindness, of his brother, James II, in a few years brought things to a head. Invited by the leaders of the Whig party, William of Orange had but to lead to put an end to the Stuart dynasty and drive James from the country. William was the first parliamentary king; for before power was put in his hands a binding charter set forth the liberties of the country. When the last attempt of the Stuarts to regain the throne was thwarted in 1715, Parliament settled the Hanoverian house upon the throne, and since that time through the reigns of the four Georges, William IV and Victoria, England has had what is called a constitutional government. It was in the reign of Anne that party-government began. Marlborough did not have complete success in his wars till he found himself supported in 1708 by a ministry all of one party. From that time the ministry, really a committee of the majority of the house of commons and known as the cabinet, has formed a part of the machinery of government. Under Elizabeth England had become a world-power, but not till the Revolution of 1688 did it become a power of the first rank in Europe. Then, under William and Marlborough, England forced its way to the head of the European nations in the wars against Louis XIV. Under the great Chatham her navy was supreme upon the ocean, and under his greater son, Pitt, English money, English troops and English successes in Spain were the great causes of Napoleon's downfall. In the 19th century the wars the nation fought were avowedly in the interests of her colonies, while she kept more aloof from the politics of the continent. The most marked thing in the history of the 19th century was the rise into greater prominence of the trading, manufacturing and laboring classes, who were given representation in Parliament by the great reform-bill of 1832. Since that time England has been slowly but surely growing into a real democracy. With the decease (May 6, 1910) of King Edward VII, George V succeeded to the throne.

The part played by England in the World War, (*q. v.*) which came in the fourth year of King George's reign, and its vast importance in determining the result, is fully dealt with in the article on that subject. The greatness of England's achievement is further enhanced when the difficulties under which she was laboring at the time she entered the conflict are considered; Ireland on the verge of civil war, the army far below its proper standard, the mother country in dispute with her colonies over the question of shipbuilding—to mention only some of the more conspicuous.

Yet, by April following the invasion of Belgium in 1914, three-quarters of a million men, responding to Lord Kitchener's appeal, had been safely transported across the Channel in spite of the submarines, and Lord Derby's recruiting campaign in the three concluding months of the same year placed over 800,000 more in the ranks of the volunteers.

Then came conscription, the taking over by the government of all factories capable of producing munitions of war, the formation of a coalition cabinet, with Lloyd George as minister of munitions. Lloyd George later became prime minister and was the greatest force in bringing the war to a successful conclusion.

England is divided into 45 counties. Nine cover over 1,000,000 acres each, the largest being York. Seven have a population of over 1,000,000, the largest being London. Population of England and Wales 36,075,269, and that of the United Kingdom is 45,216,741. See the histories by Green, Freeman, Froude, Stubbs, Lingard, Hume and Macaulay and the *Epochs of Modern History* series.

Englewood, Bergen County, N. J., is 14 miles from Jersey City, and the run from there to New York is made in 35 minutes. It has excellent schools, including a fine new high school, an efficient fire equipment, public library, hospital, park and boulevards. Population, 12,000.

English Channel. See CHANNEL, ENGLISH.

English Language, The, now spoken by 130 millions of people as their native tongue, especially in the British Isles North America, South Africa and Australasia, was in the fifth century, A. D. the

speech of but a few thousand Teutons who landed in England from their homes about the mouths of the Rhine, the Weser and the Elbe. At that day the English language probably had some 2,000 words; at present its vocabulary is variously estimated at from 38,000 to more than 100,000 words. The English-speaking Angles, Saxons and Jutes became the conquerors of the Britons from whose language they adopted a few Celtic terms. Most of these words had reference to domestic occupations, as for example *clout*, *cradle*, *darn*, *mop* and *pillow*. English belongs not to the Celtic but to the Teutonic group of the Indo-European family of languages. Owing to the fact that it was originally spoken by the dwellers on the low-lying coastal plains which border upon the North Sea, it is often described as the "Lowest" variety of the Low-German speeches. Even at the present time English is closely akin to the Dutch, the Flemish and, especially, the Frisian dialect.

Before the end of the 6th century the position of the English in Britain had been secured. The Angles gave their name to the language. There however were several dialects in the old English speech; and these dialects endured for several hundreds of years. Old English or Anglo-Saxon was a highly inflected tongue. Nouns and adjectives had several declensions, nouns had five cases, and verbs were distinguished by far more inflexions than is at present the case. The poems of Cædmon and Cynewulf and the prose of King Alfred illustrate the English of this period. Alliteration was the device employed in poetry in the place of rime. The Anglo-Saxon forms of poetry and prose survived the Norman Conquest, but the opening of the 12th century saw the rise of an important stream of Norman-French influence. The two principal books written in English between 1100 and 1250 are the *Ormulum* of Orm and the *Brut* of Layamon; and these books, although their forms are still Anglo-Saxon, already contain many French words.

In the Middle-English period, between 1250 and 1500, the old English inflexions gradually but finally disappeared. This was a natural result of the Norman and French intolerance of strange inflexions, but the disappearance of inflexions had begun even before the Conquest. Foreigners were willing to learn English words, Englishmen were forced to learn foreign words; but neither Englishmen nor foreigners found it necessary to retain the endings of the early English grammar. French was the fashionable and literary language during most of this period; but the use of it declined from the middle of the 14th century. In 1362 an act of Parliament permitted the use of the English language instead of Norman-French in the law-courts. In the latter part of this period the English language in the hands of Geoffrey Chaucer (1340-1400) touched a literary height hitherto unknown.

During the Tudor period and, above all, during the reign of Queen Elizabeth the English language became, as it were, standardized in poetry and prose. Shakespeare and Marlowe in the drama, Spenser and Milton in the epic and Hooker, Bacon and the compilers of the English Bible and Prayer-Book in prose founded a body of classic literature that gave to English a unity of form which had been sadly wanting in the Middle-English period. Meantime many foreign words crept into the English tongue. The revival of learning was responsible for a vast influx of terms borrowed or coined from the Latin and Greek, but principally the Latin.

Modern English has changed comparatively slowly, except by the adoption of new terms to express new ideas or to denominate novel inventions and things. Many of the new terms in Modern English are of a technical or scientific nature. Tennyson and others have attempted to revive good English words that had been for some reason forgotten. It is unfortunate, perhaps, that the English language no longer lends itself to the formation of compound terms after the fashion of German and the oldest English tradition. [It virtually forms compounds still, though the *form* is not always that of a compound.]

To conclude, English is a composite language. It includes a few Celtic terms and many Latin terms; but the body of the language, including most of its common and familiar works, is of Teutonic origin. Of the Latin terms, a few were introduced during the Roman occupation of Britain, many more through the French and many philosophic and scientific words through the Renaissance movement. Modern scientific terms in English are largely constructed from Greek roots; foreign words have been freely added whenever needed, as in commerce.

Engraving, in the strict sense of the word, is the art of graving or cutting marks or figures upon tablets of any hard substance. Certain forms of the art—as engraving for ornamental purposes upon metal, engraved writing upon tablets, gem-engraving in making signets, cameo-engraving etc.— are very old. But in a more special sense the word engraving is understood to mean the cutting of designs upon metal-plates or blocks of wood for the purpose of printing impressions from them in ink upon paper. Engravings of this sort are divided into engravings upon metal, in which the lines to be printed are sunk in, and engravings on wood, in which the lines to be printed stand out in relief.

the wood between them being cut away. In metal-engravings the plate, having been inked and wiped on the surface, keeps the ink only in the hollowed lines, from which it is conveyed to the paper by the pressure of the printing-press. In wood-engraving only the raised part of the block is inked, by means of a roller, and it prints as a raised type.

The metal most commonly used for engraving has been copper; but during the 19th century steel was largely used on account of its hardness, which enables it to stand the wear of printing and to throw off a far larger number of impressions than could possibly be got from a copper-plate. Steel, however, is less readily engraved than copper, and the finished engraving is thus apt to be not so good. By a late invention the surfaces of copper-plates are protected by a very thin coating of steel, placed upon them by an electric battery, which enables them to give a larger number of good impressions without being worn. Zinc-plates have also been used for etchings. In line-engraving the main tool used is the burin or graver, a small bar of steel, pointed at one end and with the other fixed in a rounded wooden handle. This burin is held between the engraver's thumb and forefinger and pushed forward by the pressure of the palm on the handle, and cuts upon the plate of polished metal a line, broader or deeper according to the pressure and the angle at which the burin is held. In etching the plate is coated with a thin, transparent surface or ground that acid will not eat. The plate is then smoked black, so that the lines drawn by the etcher will show the shining metal underneath. The design is drawn with an etching-needle — a sharp steel point in a handle. The needle merely takes away the ground, showing lines of the bare metal ready to be acted on by the acid. The back of the plate is coated to protect it, and the plate is put in a nitric-acid bath. The acid attacks and corrodes or eats the metal along the lines drawn. When the lines which are to be the lightest and palest in the etching are bitten, the plate is taken out, and these lines covered with a varnish which keeps the acid from eating them any deeper. Then the plate is put back for the acid to eat the other lines out more deeply, till the etching is finished. What is called soft-ground etching is simply another method (of which there are many) of drawing the design. In mezzotint engraving the plate is roughened — raising a "bur" of small metal points — so that if the plate were then inked and printed it would yield a uniform black impression. The mezzotinter draws his design and then scrapes away all but the lines he wishes to appear black in the printed engraving. Engraving in recent times has suffered much because of the work done by photographic processes. The beauty of what are known as photogravures or heliogravures, reproducing paintings, drawings and photographs, makes it likely that this process will altogether take the place of engraving. See WOOD-ENGRAVING, LITHOGRAPHY, PHOTOGRAVURE; also *Etcher's Handbook* by P. G. Hamerton; Ottley's *Early History of Engraving;* and Bryan's *Dictionary of Painters and Engravers.*

Enid, county-seat of Garfield County, Oklahoma, 50 miles from El Reno. It is located in a good agricultural region, in which the leading crop is wheat. Its industries include railroad-shops, flour-mills, a brick-works, yeast, broom and ice-factories. It has good schools, a fine court-house and substantial business-blocks. The city was established in 1893, at the opening of the Cherokee strip, and has grown steadily. It has the service of three railroads and a population of 15,799.

En'silage or silage, the general name given to green crops, especially corn, packed in enclosures constructed for that purpose called silos, to be fed to stock. The practice of thus preserving green crops for fodder originated about 1800, and in the United States about 1875.

Silos are quite simple in construction. They may be built of wood, and so are comparatively inexpensive. The essential points to be observed in their construction are (1) to have the walls as smooth as possible inside, (2) to have few corners, preferably having it round or square and (3) to have them as nearly air-tight as possible. If built of wood, the walls may be coated with coal-tar.

In filling the silo with corn, the entire plant is taken at maturity, just before the leaves begin to lose their moisture. It is cut into pieces one or two inches long and then closely packed in. If the silo is air-tight and the corn is evenly and tightly packed, there is little danger of its spoiling. If the crop is unusually dry, a considerable amount of water should be poured upon it while it is being packed. The layer at the top may be kept from spoiling by covering it with eight inches of chaff or cut-straw until ready for use.

It is calculated that food equivalent to four tons of hay can ordinarily be produced from one acre of corn. This makes corn preserved in a silo a profitable crop, especially as it can be so compactly and economically stored. Though corn is the most satisfactory crop for ensilage, red clover, oats, rye, alfalfa, millets and cow-peas are also used. About one cubic foot of silage (30 or 40 pounds), along with other foods, is considered the right quantity per day for one cow. Though silage has been successfully fed to horses, sheep and beef-cattle, it is especially suitable for

milch-cows, and a silo is consequently an important adjunct of a modern economical dairy-farm. Care should be taken to give relatively small amounts of silage to dairy-cattle until they become accustomed to it. In composition silage is not materially different from the fresh green corn.

Entomology. See INSECTS.

En'zymes (often called soluble ferments), substances of unknown but very complex composition produced in plants and animals for digesting insoluble foods or those which cannot be used readily without such change. The changes they produce are of two sorts: (1) the commoner consists in causing the food to take into its composition an additional molecule of water; (2) without any additions it may be split up into two or more compounds. Enzyme itself does not take part in the chemical reaction, but seems to act only by its presence. Consequently a very small amount of an enzyme may digest large quantities of a food. Each enzyme is restricted in its action to a particular substance. Some of the more important enzymes, the substance on which they act and the chief products are shown in the following table:

ENZYME	SUBS. ON WHICH IT ACTS	PRODUCT
Diastase	Starch	Malt-Sugar
Ptyalin	Starch	A sugar
Cytase	Cellulose	A sugar
Invertase	Cane-Sugar	Grape-Sugar and Fruit-Sugar = "invert sugar"
Maltase	Malt-Sugar	Grape-Sugar
Inulase	Inulin	Fruit-Sugar
Emulsin	Glucosides	Glucose, etc.
Pepsin	Proteids	Peptones
Trypsin	Proteids	Amides
Lipase	Fats	Glycerin, fatty acids
Zymase	Sugars	Alcohol, carbon dioxid

Epaminondas (*ē-păm'ĭ-nŏn'dăs*), the greatest of Theban generals and statesmen, was born toward the end of the 5th century B. C. He was descended from an old family which had become poor, and he was unknown till he was 40 years old. He is said to have saved the life of Pelopidas in battle in 385, which was the beginning of one of the most famous friendships of olden times. Thebes had been in the hands of a Spartan garrison, but when they were driven out by a desperate but successful stratagem, Epaminondas stepped forward at once into the ranks of the patriots. He was sent to Sparta in 371 to bring about a treaty of peace between the two countries. Here he displayed as much firmness and dignity as eloquence in the debate which ensued upon the question whether Thebes should sign the treaty in the name of all Bœotia. This would have been a recognition by Sparta of her claim to be supreme over all the Bœotian towns. To this the Spartans objected, and the war went on. Epaminondas was given the chief command, and, along with Pelopidas, with an army of 6,000 men defeated twice that number of the enemy at Leuctra (371). Two years later, with Pelopidas, he marched into the Peloponnesus and persuaded several of the allied tribes to fall away from Sparta. On going back to Thebes, Epaminondas was accused of having broken the laws of his country by keeping the chief power in his hands beyond the time appointed by law, but he made a strong defense and was acquitted. In the spring of 368 the war between Thebes and Sparta was renewed with greater fury than ever. Epaminondas made a second and somewhat unsuccessful invasion into the Peloponnesus. To make up for this unsuccessful undertaking, he marched with 33,000 men into Arcadia, and joined battle with the main body of the enemy near Mantinea in 362 B. C. Epaminondas charged at the head of his men and broke the Spartan phalanx, but was fatally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, he waited till he heard that his Thebans had won the victory, then drew out the javelin with his own hand, saying: "I have lived long enough." His death was the death-blow to Theban supremacy.

Ephesus (*ĕf'ē-sŭs*), one of the twelve cites of Asia Minor settled by the Ionian Greeks, was in Lydia, near the mouth of the River Cayster. It was long before Ephesus became of importance, though a sacred city from an early time. Conquered first by the Lydian and next by the Persian kings, it came, after the death of Alexander the Great, under the government of his favorite bodyguard, Lysimachus, by whom it was greatly strengthened. At last it came into the possession of the Romans. In the time of Augustus it was the greatest place of trade of all the cities of Asia west of the Taurus. This was its position when visited by St. Paul, who lived here for three years, and wrote one of his great letters to its Christian church. But the destruction of its great temple by the Goths in 262 A. D. gave it a blow from which it never recovered. In 431 the third great council of the Christian church was held here. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane, it had almost wholly perished. Among the ruins of Ephesus are fragments of a great theatre—alluded to in the account

of St. Paul's preaching in the city—of a music-hall and of many walls and towers. About a mile northeast of the city was the famous temple of Diana. This wonderful building, one of the seven wonders of the world, was set on fire by an Ephesian, it is said, on the night Alexander the Great was born, thereby to give him an undying name. It was afterward rebuilt by the people in greater splendor than before, even the women giving their jewels to raise the necessary money. It was the largest Greek temple ever built, being 425 feet long and 220 wide. It had 127 columns, each sixty feet high. It was filled with statues and pictures made by the best of Grecian artists. The altar of the goddess was adorned with the work of Praxiteles. It was robbed of its treasures by Nero, burned by the Goths, and finally destroyed in the reign of the Roman Emperor Theodosius I, who issued his celebrated edict against the ceremonies of the pagan religion in 381 A. D. The site of the temple was discovered in 1869, and excavations were made until 1874, which have greatly increased our knowledge of this wonder of the world. See Falkner's *Ephesus and the Temple of Diana.*

Epictetus (*ĕp'ĭk-tē'tŭs*), a celebrated Greek philosopher, was born at Hierapolis, in Phrygia, about 50 A. D. He at first was a slave and stood his master's harsh treatment like a true Stoic. After being freed, he studied philosophy, and with other philosophers was driven into exile by the Emperor Domitian. He settled at Nikopolis in Epirus. He left no works behind him, but his pupil, Arrian, who wrote a life of Alexander the Great, gathered his sayings and maxims with a lover's care into the *Enchiridion* (Hand-book) and into eight books of commentaries, four of which are lost. These show the simple and noble earnestness of the philosopher's character, as well as his real, heartfelt love of good and hatred of evil. He is one of those who, "groping in the deeps of thought, touched God's right hand and knew it not." See Farrar's *Seekers after God.*

Epicurus (*ĕp'ĭ-kū'rŭs*), a famous Greek philosopher, was born in 342 B. C. on the island of Samos, where his father was a school-master. When eighteen he went to Athens, but soon came back to Asia. He studied philosophy, and at Mitylene, in his thirty-second year, he first opened a school of philosophy. After teaching five years, he went again to Athens in 307 B. C., and set up a school of philosophy in a garden which he bought and laid out for that purpose—whence his followers were called the "philosophers of the garden." Although Epicurus taught that pleasure is the chief good, the life that he and his friends led was one of the greatest simplicity. They were content, we are told, with a small goblet of light wine, and the rest of their drink was water. And an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. Epicurus was very successful as a teacher. Great numbers flocked to his school from all parts of Greece and Asia Minor, most of whom became fond of their master as well as of his teaching, for Epicurus seems to have been no less amiable and kind a man than a man of force and brains. He wrote a great deal. According to one account, he left 300 volumes on Natural Philosophy, Atoms and the Vacuum, Love, the Chief Good, Justice and many other subjects. These works are lost. The only writings that have come down to us are three letters, a few fragments from one of his works and a number of his sayings. The main sources of our knowledge of his teachings are Cicero, Plutarch and, above all, Lucretius, whose great poem, *De Rerum Natura* (On the Nature of Things) contains the Epicurean philosophy. According to Epicurus the great evil with which men were troubled—the load which weighed down man's happiness—was fear—fear of the gods and fear of death. He did not deny that there are gods, but taught that as "happy and undying beings" they could have nothing to do with the affairs of the world or of men. For, he said, business and cares and anger are not in accordance with happiness, but arise from weakness fear and dependence on others. He believed that the soul was a bodily substance, made up of fine particles scattered through the whole body, and, this being so, that soul and body died together. He therefore argued that the most terrible of all evils, death, is nothing to us, "since where we are, death is not; and where death is, we are not." He held that pleasure was the chief good, and it is from misunderstanding of the meaning of this word as used by him that the term Epicurean came to mean one who gave loose rein to all his likes and appetites. For, he tells us, it is not ceaseless drinkings and revelings, nor rare and costly viands, that make up a pleasant life, "but freedom of the body from pain and the soul from care." Among the Romans the system of Epicurus was adopted by many distinguished men, such as Horace and Pliny the Younger. In modern times many prominent Frenchmen have professed to be Epicureans. Epicurus died at Athens in 270 B. C. See Zeller's *Philosophy of the Stoics, Epicureans and Skeptics.*

Epider'mis (in plants), a specially modified layer of cells which covers all parts of higher plants. In the older parts of stems and roots, which increase in diameter year after year, the epidermis disappears, being replaced by other layers, usually cork. The epidermis is primarily a protective layer, which is interposed between delicate living

cells and outside exposure. Since these living cells must effect exchanges with the outer world, the epidermis is not merely a protective layer, but must be organized in such a way that it may facilitate these exchanges. Its duties, therefore, are numerous. The epidermis is able to produce a variety of structures, conspicuous among which are hairs of many kinds. Wherever the epidermis covers green tissue it also organizes very numerous stomata, commonly known as breathing pores or automatic gateways, through which various gases pass in and out in connection with the work of the green cells. See figure under STOMATA.

Epig'ynous (*ē-pĭj'ĭ-nŭs*) **Flowers,** those in which the sepals, petals and stamens seem to arise from the top of the ovary. In such cases the ovary is often said to be inferior, that is, it is to be seen below the flower, as in the common honeysuckle. The contrasting term is hypogynous. Epigynous flowers are regarded as of higher rank than those that are hypogynous, and in the highest family, the Compositæ, the flowers are all epigynous. The noun form is epigyny. See FLOWER.

Epiphytes (*ĕp'ĭ-fīts*), commonly called air-plants, since they obtain all their food supplies from the air, having no connection with the soil or with water. They occur in great numbers in the tropics, especially the American tropics, and are found perching in great numbers upon other plants, the trees sometimes being almost covered with them. Many ferns have this habit, but it has been most cultivated by orchids and bromelias. The epiphytic orchids, with their dangling roots and odd-looking but brilliant flowers, are favorite greenhouse-plants. One of the common epiphytes of the United States is the so-called long moss or Spanish moss, which hangs in gray masses among the trees of the gulf states. It is not a moss, but a flowering plant, one of the bromelias.

Epirus (*ē-pī'rŭs*), meaning mainland, is the old name of a part of Greece lying between Illyria and the Ambracian Gulf and between the Ionian Sea and the mountain chain of Pindus. It is a mountainous region, heavily wooded and growing little wheat, though noted for its cattle and horses and for its breed of Molossian shepherd-dogs. Its best known river is the Acheron; its chief towns Dodona and Ambracia. In early times, as to-day, its people were only half Greeks, the Greek colonies being confined to the coast and southern portion. Of the Molossian kings of Epirus, the most famous was Pyrrhus, who long waged successful war against the Romans. On the conquest of Macedonia by the Romans (168 B. C.) the most revengeful measures were put in force against the Epirotes, who had helped Perseus, the Macedonian king. Æmilius Paulus, the Roman general, plundered and razed to the ground seventy towns of Epirus, and sold into slavery 150,000 of the people. From that time Epirus shared the good or bad fortunes of the Roman and Byzantine empires until 1204. Then small princes ruled the country until the 15th century, when it was at last conquered by the Turks. Epirus, peopled largely since the 14th century by the Albanians, formed latterly a part of the Turkish province of Janina. Under pressure from the great powers, Turkey ceded the strip of land east of the River Arta to Greece in 1881.

Ep'ping Forest, where kings hunted in the olden days, once covered all of Essex (England), and extended almost to London. Inclosures slowly curtailed it from 60,000 acres to 4,000 in 1871, when London undertook to preserve what was left and to recover the later inclosures. In 1882, at a cost of $2,000,000, 5,600 acres of Epping Forest were opened to the public. Easily reached from London, its nine square miles of almost unbroken woodland, which at High Beech or Queen Victoria's wood, rises 759 feet above sea-level, form one of the largest and most beautiful pleasure-grounds in Europe. See E. N. Buxton's *Epping Forest.*

Ep'som, a small town market of Surrey, England, fifteen miles southwest of London. The springs which made Epsom so fashionable a resort in the latter half of the 17th century, gave name to the Epsom salt, formerly made from them. The church, rebuilt in 1824, contains monuments by Flaxman and Chantrey. On Banstead Downs, one and a half miles south of the town, the most famous horse-races of the world are held yearly on Derby day. The grand stand was built in 1829-30 at a cost of $100,000, and seats 7,500 spectators. Population, 10,915.

E'quinox, the time when the sun is in the plane of the earth's equator. This occurs twice a year, once on March 20th, which is called the vernal equinox, and again on Sept. 22d, which is called the autumnal equinox. The name is derived from the fact that the length of the night then exactly equals the length of the day, since the parallel rays of light from the sun, on these dates, fall upon the earth perpendicular to the axis of the earth. The sun then appears to be on the equator, and hence the equinoxes are popularly spoken of as the dates on which "the sun crosses the equator."

Equisetales (*ĕk'wĭ-sē-tā'lēz*), one of the three great plant-groups which make up pteridophytes, commonly known as horse-tails or scouring rushes. In early geological times the group was of great importance, and was represented by a great display of forest-forms. At present it contains but a single genus (*Equisetum*), represented by about twenty-five species. The equisetums have a very characteristic body. The stem is slender and jointed, and the joints sepa-

rate easily. It is also green and fluted, and there is so much silica in the epidermis that the plants feel rough. It is on this account that the name scouring rush is sometimes used. Foliage leaves have been abandoned, but minute scale-leaves form sheaths at each joint. The stems are sometimes simple, at other times they branch profusely, but they are always green, since they do leaf-work. At certain times a cone-like structure, the strobilus, appears at the top of the stem, which bears the sporangia containing spores. Horsetails are found in wet ground or in very dry ground. Slender branching forms are very common along the sandy embankments of railroads. See PTERIDOPHYTES.

JOHN M. COULTER.

Era of Good Feeling, a name given to the period in American political life from 1817 to 1824, during which there practically was only one party—The Democratic-Republican. The Federalist party had almost disappeared by the end of the War of 1812, so that in 1821 President Monroe was reelected by an electoral vote of 231 out of 232. Differences of opinion regarding public works and the tariff question soon afterwards brought the era of good feeling to a close. By some historians the period is restricted to the second term of Monroe's administration.

Erard (*ā'rär'*), **Sebastien,** a French inventor and maker of musical instruments, was born at Strassburg, April 5, 1752. Going to Paris at sixteen, he started in business as a maker of pianos, completing his first one in 1776 or 1777. This was one of the earliest pianos made in France. He was soon considered the best pianoforte maker in Europe. The French Revolution drove him to London, where he established a factory. The grand piano was his invention, with a double-action harp and many other valuable improvements in the making of both pianos and harps. His pianos still have a reputation. He died at Passy, near Paris, Aug. 5, 1831.

Eras'mus, Desiderius, a Dutch scholar and philosopher, was born at Rotterdam, according to the date on his statue, in 1467. His guardians tried to induce him to enter a monastery, in order to obtain his property, and Erasmus, to please them, agreed to attend the Augustinian College of Sion, near Delft, where for six years he led the life of a monk. This life probably made him the bitter and sarcastic enemy of the monks that he was during the remainder of his life. He studied and taught in Paris till 1498. Among his pupils was Lord Mountjoy, at whose invitation, probably, he made his first visit to England, in 1498. He spent his time there mostly at Oxford. Six years spent in Paris give us the *Adagia*, a collection of Greek and Latin proverbs, and the *Christian Soldier's Dagger*. Another visit to England was made at the accession of Henry VIII, and on this journey he planned his *Praise of Folly*, a satire on kings and monks. He was professor of divinity and also of Greek, at Cambridge, for the next few years. In 1519 appeared his most famous work, the *Colloquia*, a series of talks on everyday subjects, the sharpness and boldness of which did much to prepare the minds of the people for the work of Luther. In 1516 his edition of the New Testament in Greek, the first published Greek text, appeared. He also edited scores of Greek and Latin texts. When the Reformation came, Erasmus stood between the two parties, and the last years of his life were spent in a long dispute and struggle with the friends and foes of the new religion, neither of whom he satisfied. In spite of these troubles, he enjoyed fame and consideration beyond that of any man-of-letters before or since. He died at Basel, Switzerland, July 12, 1536. See *Essays* by Milman, *Life* by Drummond, *Letters* edited by Froude and *Life* by Emerton.

Er'ebus, Mount, an active volcano in Victoria Land in the Antarctic regions. It was discovered by Ross in 1841, and named after one of his ships. It is 12,367 feet in height, and is the nearest volcano to the South Pole.

Erfurt (*ĕr'fŏŏrt*), a city of Prussian Saxony and the ancient capital of Thuringia, is thirteen miles from Weimar. Its two citadels once were monasteries. It was a strongly fortified city until 1873, its position on the central road through Europe giving it importance. Its cathedral, one of the oldest Gothic buildings in Germany, has very fine sculptures and bronze castings, one especially, a *Coronation of the Virgin*, which dates from the 16th century. The Augustine monastery, known as the home of Martin Luther, is now called the Martinsstift (Martin's Institute), and is used as an orphan asylum. The growing of flowers and vegetables and the raising of flower seeds are two of the principal industries. There also are manufactures of woolen, silk, cotton and linen goods, lamps, machines, shoes and beer. It was made a bishopric in 741. Since 1803 it has belonged to Prussia, except during 1806–14. The congress of Erfurt, held in 1808, was attended by Napoleon, the emperor of Russia and several princes of Germany. Population, 111,461.

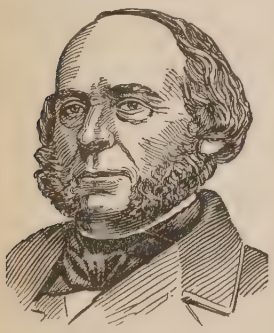
Erg, the unit of work employed in physics and chemistry. It is defined as the amount of work done by a force of one dyne when exerted through a distance of one centimeter. It requires forty-two million ergs of work to heat one gram of water one degree centigrade, that is,

1 calorie $= 42 \times 10^6$ ergs, very approximately.

Er'got, a very astringent drug, obtained from a certain phase (the sclerotium) of a

fungus which is parasitic in the young ovaries of grasses, ordinarily of rye, and known as *Claviceps purpurea*. These sclerotia are usually elongated, dark-violet masses, which are conspicuous in the heads of rye. The fungus belongs to the *Ascomycetes*, which see.

Ericsson (*ĕr'ĭk-sŭn*), **John,** a great Swedish engineer, was born at Langbanshyttan in 1803. He entered the Swedish army, but left it after several years' service, to give his entire time to his inventions. He gained a prize in England for the best locomotive; and the principle which he introduced, of making a draught artificially so as to do away with the huge smoke-stacks which had been in use, is still employed. He invented soon after a steam fire-engine and the screw-steamer. In 1839 he came to the United States, and designed the screw-propeller for the warship *Princeton*, the first steamer that had her engines and boilers below the water line, so as to be out of the reach of shot. During the Civil War he built for the government the iron-clad vessels called monitors, from the name of the first one. These ships had a turret that turned by machinery, so that the guns could be pointed in any direction. Though laughed at by sailors, who called them a "cheese-box on a raft," they were very successful and formidable, and became famous all over the world. Among his numerous inventions are a gauge for measuring fluids when under pressure, an alarm barometer, a meter to measure the quantity of water which passes through a pipe, a pyrometer, an instrument for taking distances at sea and a sea-lead for taking soundings. He died at New York on March 8, 1889. By his own wish he was buried at his birthplace, a Swedish war-vessel coming to escort his body home, which was sent by the United States government in the man-of-war *Baltimore*. A statue is to be erected to his memory at Stockholm. See *Life* by W. C. Church.



JOHN ERICSSON

Erie, Pennsylvania, county-seat of Erie County, is situated on Lake Erie. It is the only lake-port of the state, and has the best harbor on Lake Erie, five miles in length and protected by a breakwater four miles long. It occupies the site of Fort Presque Isle, an old French fort, and is about halfway between Cleveland and Buffalo. Its lake-trade is large, consisting mainly of lumber, iron-ore, coal and petroleum. It has factories of stoves, steam-engines, car-wheels, bricks, leather, organs, pumps, brass-foundries, several oil-refineries breweries, etc. It is supplied with water from the lake, which is pumped to a tower 251 feet high, said to be the highest water-pipe in the world. The government-building, city-hall, St. Vincent's Hospital, Hamot Hospital, U. S. Marine Hospital, Home for the Friendless, Union Depot, opera-house and soldiers' home are among its chief buildings. Near the city is a memorial in the form of a blockhouse, in honor of Anthony Wayne, erected by the state. The city has excellent public schools, a public library, three national and several savings-banks, daily and weekly newspapers and natural gas. It was laid out in 1795, and became a city in 1851. Population, 66,525.

Erie Canal. See CANAL.

Erie, Fort, was situated in Welland County, Ont., on Niagara River, almost opposite the present site of Buffalo. It was captured by General Brown at the head of a column of 6,000 Americans on July 3, 1814, the garrison consisting of 170 soldiers and volunteers, and evacuated by them on Nov. 5. It was unsuccessfully assaulted by General Drummond on Aug. 15, the accidental explosion of a powder chest nearly annihilating the storming party.

Erie (*ē'rĭ*), **Lake,** one of the five great lakes of North America which empty into the St. Lawrence River. Ohio, Pennsylvania and New York are on its southern shore, Canada on the northern one and Michigan on its western. It receives the waters of Lakes Superior, Michigan and Huron through the Detroit River, and discharges them through the Niagara River into Lake Ontario. It is 240 miles long and from 30 to 60 broad, its entire area being 9,600 square miles. At its southwestern end are several islands, some of which are cultivated and are noted for their vineyards. It is the shallowest of the five great lakes, and this, with the small number of good harbors, makes navigation dangerous and difficult. The chief harbors are Buffalo, Erie, Dunkirk, Cleveland, Sandusky and Toledo. It is connected with Lake Ontario by the Welland Canal, with the Hudson by the Erie Canal and with the Ohio by the Ohio and the Miami Canals. It receives no large rivers. A naval battle under Commodore Perry was fought with the British on the lake, Sept. 10, 1813. The victory is commemorated by a monument at Cleveland, O., and by a stone on the island of Gibraltar, near the spot of the engagement.

Eritrea (*ā-rē-trā'a*), an Italian colony on the Red Sea, extending from Cape Kasar to Cape Dumeirah on the Strait of Bab-el-Mandeb. It is bounded on the north and

west by the Egyptian Sudan. Abyssinia bounds it on the south and west, and French Somaliland on the southeast (see ABYSSINIA). Its coast-line is 670 miles long, its area about 88,500 square miles, and its population, nearly all nomadic, estimated at 450,000. It is self-governing, and has the management of its own finances. Asmara is the seat of government; Massawah the principal town, with 2,275 inhabitants. Gold has been found near the latter town. Irrigation works are required for agriculture, but pasture is abundant.

A railway is projected from Asmara to Massawah, of which 48 miles are open. There are telegraph lines from Massawah to Perim by way of Assab and from Massawah to Addis Abeba.

Erl-king. See FAIRY.

Ermine (*ĕr'mĭn*) or **Stoat,** an animal of the same class as the weasel and mink. It has a slender body, about ten inches long, and short legs. In summer it is a reddish-brown color with yellowish-white fur underneath; but in winter it changes to a beautiful white, all except the tail, which always remains black. It is a quick, restless, brave and bloodthirsty animal, runs swiftly and climbs and swims well. It makes its home among rocks and stones, and feeds on smaller animals, such as birds, rats, mice and chickens, sucking the blood of each of its prey. It is found in Europe as far south as the Alps and in Asia and America. The ermine-fur used in trade is the white fur with the black tails inserted in regular order. It was formerly used in the linings of the robes of kings and queens and other high officials, but is not so popular now. The best furs are imported from Siberia, Lapland and the Hudson Bay territories.

Erskine (*ĕr'skĭn*), **Thomas, Lord,** a British orator and jurist, was born on Jan. 21, 1750. He was sent to sea against his will, entering the navy in 1764. On his return he studied law at Cambridge, England, and was admitted to the bar in 1775. In his first case he made a wonderful plea, which at once gave him high rank as a lawyer. He was elected to Parliament in 1783 and 1790, but his speeches in Parliament never equaled his efforts as a lawyer. He held the offices of attorney-general and chancellor to the Prince of Wales. This last position he lost by his defense of Thomas Paine. He was made Baron Erskine in 1806, and died on Nov. 17, 1823. He published several pamphlets, a romance, a few poems and *View of the Causes and Consequences of the War with France*, which ran through 48 editions. His reputation, however, rests entirely on his speeches as a lawyer, and in this respect he is unrivaled in the history of the English bar. See Campbell's *Lives of the Chancellors.*

Erzerum (*ĕrz'rōōm'*), a town and vilayet in Armenia, Asiatic Turkey, on the west branch of the Euphrates, is on a plain 6,200 feet above the sea and surrounded by mountains. The streets are crooked, narrow and dirty. The houses are built of volcanic stone cemented with mud. The city with its four suburbs has 40 mosques, a number of large bazars and a few fine buildings, with many ruins of former magnificent structures. The principal trades are tanning, dyeing morocco leather and blacksmiths' and coppersmiths' work. Its copper and iron wares are widely known. It was captured by the Russians in 1829 and 1878. It is now a Turkish city. It is the residence of English, Russian, German and French consuls. Population, 38,900. See Curzon's *Armenia.*

Esarhaddon (*ē-sär-had'on*), an Assyrian king, was the son of Sennacherib and his successor. He reigned from 680 to 668 B. C. He held his court alternately at Nineveh and at Babylon, being the only king of Assyria who ruled over Babylonia during his entire reign. His conquests extended as far as Cyprus and through a large part of Media. He was the first Assyrian king to invade Egypt, and was called king of Egypt and Ethiopia. He also conquered Judæa, carrying its king, Manasseh, captive to Babylon.

E'sau, also called Edom, the eldest son of Isaac and twin brother of Jacob, was the ancestor of the Edomites, an ancient people inhabiting Mt. Seir. He was a wild hunter, rash, passionate and generous, and no match for his crafty brother Jacob. When hungry from a long hunt, he sold Jacob his birthright as the elder son for a mess of pottage; but his anger, when he realized what he had done, was so great that Jacob fled into Mesopotamia. Esau met his brother, however, on his return from his long exile, and was reconciled to him.

Escalator, a device often called a moving staircase, is a means of carrying people from level to level by means of a system of moving trucks which are bolted to a chain connected with a driving-wheel. The trucks have the appearance of a series of steps. At top and bottom the trucks are of the same level, so that there is practically a platform which gives passengers sufficient time to step off the escalator. A curved railing, fitted with moving belts, gently shunts them off if they do not move. An example of such an escalator may be seen at the 125th St. subway station, New York City. When desired, it may be used as an ordinary staircase.

Escanaba (*ĕs'kȧ-nȧ'bȧ*), county-seat of Delta County, Mich., 52 miles northwest of Marinette. It is on Little Bay de Nouquette, an inlet of Green Bay, and has passenger and freight-steamer connection with all the leading ports on the Great Lakes. It is important as an iron-shipping

point, having five docks for iron-ore and a large one for other products, and, besides, is in the center of a vegetable, grain and lumber-region. The city has a good public-school system, a high-school, a public library, St. Joseph's high-school and a national bank. It is served by the C. & N. W. and the M. & St. P. railways. Population, 13,194.

Escurial (*es-kū'ri-al*) or **Escorial** (*ĕs-kō'rĭ-al*), a monastery, royal palace and burial place of the Spanish kings, situated 31 miles northwest of Madrid, on the slope of the Sierra Guadarrama, 3,700 feet above the sea. It was built by Philip II, and dedicated to St. Lawrence in memory of a victory which occurred on St. Lawrence's day. The main building is 706 feet long and 550 broad. A smaller square building, used as the royal palace, projects from the east side. It was begun in 1563 and finished in 1584. It held one of the finest collections of pictures in Europe until 1837, when a hundred of the best were taken to Madrid. The burial place of the royal family, called the Pantheon, is an eight-sided room beneath the church. The kings of Spain, from Charles V to Alfonso XII, all but Philip V and Ferdinand II, are buried here in marble tombs, placed one above another in niches in the wall. The Escorial was much injured by fire in 1872.

Esdraelon (*ĕs'drȧ'ē-lŏn*) or **Plain of Jezreel,** a valley in Palestine, extending along the River Kishon from Mt. Hermon to Mt. Carmel. It is a fertile plain, and is in the shape of a triangle, its longest side measuring 18 miles in length. Here Gideon defeated the Midianites, and in 1799 the French under Napoleon conquered the Turks. As late as 1867 the plain was annually overrun and wasted by the Arabs, but is now in a high state of cultivation. See *Haifa*, by Laurence Oliphant.

Eskimo (*ĕs'kĭ-mō*) or **Esquimaux,** a people numbering about 40,000, who are spread over the most northern parts of America, the Arctic Islands, Greenland and about 400 miles of the nearest coast of Asia. They have been found as far north as discoverers have gone, living usually within 20 miles of the seashore. They are the most thinly scattered people in the world. They seem to be allied to the American Indians, being about the same height, with slightly brown skin and coarse, black hair. They live by hunting and fishing, the seal furnishing them with food, clothes and fuel. Their houses are built of wood or stone (covered with sod) or of snow, with a funnel-shaped, half-underground passage for an entrance. The rooms are heated by lamps, and the sleeping places, somewhat like stalls, are arranged in rows along the sides, with often 50 and sometimes 200 inmates to a house. Men and women wear the same dress—a pair of trousers and a coat or sack, with a hood attached to draw up over the head, made of skins. The women use the hood as a cradle for carrying their children. The Eskimos are divided into tribes, and the tribes again into groups, while one of the oldest and most respected men is obeyed as chief of a house or wintering-place. The Eskimo of Labrador, southern Alaska and western Greenland are Christians. The name is supposed to come from an Indian word, meaning eaters of raw meat. Their name for themselves is Inuit or, in Greenland, Kaladlit. See *The Eskimo Tribes*, by Dr. H. Rink.

Esperanto, an artificial language invented by a Russian scholar named Zamenhof and first given to the public in 1887. It is designed to meet the requirements of a universal language. It seems necessary that any language to be universally adopted must be an artificial one, since national jealousy prevents the adoption of a living language, as English or French. A great advantage would necessarily be given to any nation whose language was thus universally adopted. On the other hand, the adoption of a dead language like Latin is out of the question, as it is too difficult for general acquisition. Esperanto is claimed to be very easy to learn for any person familiar with any one of the main European languages, as its vocabulary is made up of only such words as are common, though in varying forms, to the main languages of Europe.

Esquimault (*ĕs-kwī'mȧlt*). The western suburb of the city of Victoria (British Columbia). Until recently it was the headquarters of the North Pacific fleet. The ships, save one or two, have been withdrawn and the Dominion has undertaken the maintenance of the fortifications, which are amongst the strongest in the empire. Esquimault has a splendid harbor. It was formerly used exclusively by the navy, but will now be opened to merchant-vessels. There is, besides, a dockyard with a huge dry-dock. Barracks and a naval arsenal complete the equipment of the place, which is heavily fortified.

Essay (The). The essay, as a record of individual observation and personal comment on social life, was first elaborated in France by Michel de Montaigne. His book, published in 1580, has never been excelled in keen penetration, rich knowledge of life, sound judgment and frank and genial conversational comment. Lord Bacon's essays, published in 1597, are rather more like addresses or treatises in their formality; although they are brief, like letters, and pithy, like proverbs. With the rise of the periodicals, the form attained its best English expression in *The Tatler* and *The Spectator* of Steele and Addison. These brief sketches of the aspects of contemporary and local life, in their endeavor

to correct some of the minor faults of the times, added certain characteristics from ancient fable and satire, and thus anticipated the manner of much of modern political and social humor. They also embodied their experiences and observations in fictitious characters, such as Sir Roger de Coverley, thus aiding in the development of the novel and the short story. They also elaborated the criticism of history and politics, of religion and morals, of literature, art and the drama, so that these have since been regarded as separate provinces, which leave the familiar essay of to-day to apply its casual, personal and suggestive method chiefly to social manners, fashions and humors. This narrowed form has continued to flourish in England, through Goldsmith, Lamb, Thackeray and Stevenson down to the present. Literary criticism in essay form is illustrated by Coleridge, Hazlitt and Matthew Arnold in England, Sainte-Beuve in France and Lowell and Whipple in America.

In the United States, Washington Irving imported the method of humor and satire in his *Salmagundi* (1807) and the general form of the essay in his *Sketch-book* (1819). The latter contains autobiographical matter; sketches of places, things, manners and customs; studies of national and racial traits; literary criticism; tales of sentiment; and tales of mystery, like *Rip Van Winkle*. In variety of content it thus is a precursor of the magazine of to-day. Among other American essayists, Emerson deals chiefly with religion and morals, Poe and Lowell with literature. Dr. Holmes, in *The Autocrat of the Breakfast-Table*, modified the form in the direction of table-talk. Thoreau's *Walden* revived the nature essay. The tradition of Steele, Addison and Irving was continued, almost unchanged, by George William Curtis and Charles Dudley Warner.

Es'sen, a town of Prussia, 21 miles from Düsseldorf. It is situated in a rich coal and iron district, and has large manufactures of iron, tobacco, canes and vinegar, with dye works and breweries. It is known as the site of the celebrated Krupp gun-works and cannon-foundries, one of the largest establishments in the world. These works have 1,195 furnaces, 92 steam hammers, 286 boilers and 370 steam engines; they use 2,735 tons of coal and coke daily, and produce nearly 600 tons of iron a day. They employ over 20,000 workmen. The water-supply is brought by an aqueduct four miles in length. The town dates back to 873, and has an old church founded in that year. It was ruled until 1803 by the abbess of the Benedictine nunnery, who ranked as a princess of the empire. It was transferred to Prussia in 1803. Population, 294,629.

Es'sex, Robert Devereux, Earl of, was born on Nov. 10, 1567. His first service was in the Netherlands under the Earl of Leicester, his stepfather. At court he became a favorite of the queen, and was put in command of the forces sent to help Henry IV against the League in 1591. To him was largely due the capture of Cadiz (1596). He quarreled with the queen about an appointment, turning his back upon her in the presence of her ministers, and, when she resented the indignity with a box on the ear, drew his sword, swearing that he would not endure such treatment from Henry VIII himself. They were never really reconciled. After failing as lord-lieutenant of Ireland, he formed a wild scheme to get rid of Elizabeth's councilors, who were opposed to him. He entered London at the head of 300 men, expecting the people to rise in his favor, but was disappointed and forced to surrender. He was tried for treason, condemned, and beheaded on Feb. 25, 1601. Elizabeth was very unwilling to sign his death warrant, but the story of the ring given him by the queen for a safeguard and kept back by the countess of Nottingham, is now believed to be an invention. He was a writer of verse, built a monument to Spenser, and gave an estate to Bacon.

Esther (*ĕs'ter*) (a star), the Persian name of the Jewish maiden Hadassah. She was the foster-daughter of Mordecai, one of the officers of the Persian king, Ahasuerus, and was selected by the king as his wife instead of Vashti, who had refused to present herself to the king and his courtiers in the midst of a drunken revel. The king's prime minister, Haman, out of jealousy toward Mordecai had persuaded the king to issue a decree for the destruction of the Jews. But through the influence of Esther, acting under Mordecai's direction, Haman was hanged, Mordecai was made chief in his place, and another decree issued permitting the Jews to destroy their enemies. The story is found in *Esther*.

Esthonia, a former dependency of Russia, which after the World War established a republican form of government and declared its independence. Area 7,605 s.m.; pop. 1,744,000.

Ether, a medium of exceedingly great tenuity supposed to fill all known space, including that which we speak of as filled with ordinary matter. The necessity of such a medium was first recognized by Huygens, and was admitted by all other clear thinkers as soon as Römer discovered the fact that light travels with finite speed. For, when it has been shown that light requires eight minutes to travel from the sun to the earth, the query naturally arises as to what becomes of the light (*i. e.* luminous energy) between the time it leaves the sun and the time it reaches the earth. The simplest possible explanation is that it exists somewhere in the space between the sun and the earth. But in all our

experience we have never found energy except as associated with matter. For the sake of simplicity, therefore, we may assume that in this case, also, that is, in free space—space devoid of ordinary matter—luminous energy is also associated with matter. We call this matter ether. Since, however, in the 2,000 years between the time of Hipparchus and the present we are unable to detect any certain change in the length of the year, and since no retarding effect seems to be exerted upon any of the other planets, we must assume that the ether is a medium of enormously less density than the most tenuous gas of which we know anything whatever. Kelvin estimates the density of ether as 9.36×10^{-19}. Huygens, Young and Fresnel have proved, not only that light is a wave-motion, but that it consists of a transverse wave-motion. But transverse waves are possible only in a medium which possesses rigidity, *i. e.*, in a solid medium. We are driven therefore to assume further that the ether is a *solid;* or, at least, that it behaves as a solid for motions as rapid as those which constitute light. Shoemakers' wax is very brittle, as may be shown by striking it a quick blow with a hammer; but, if a hammer be laid upon a pan of shoemakers' wax and allowed to remain, it will be observed that at the end of some days the hammer has sunk to the bottom of the wax, showing that the wax behaves as a fluid with regard to slow-acting forces. The ether may behave as a fluid with respect to the comparatively slow motion of the planets through it.

In 1864 Maxwell predicted, and in 1888 Hertz proved experimentally, that electrical disturbances are propagated through space with the same speed as that of light. In other words, they proved that one and the same medium would answer for the propagation of light waves and electric waves.

Melloni and others had already proved that the laws of propagation of heat are identical with those of light. The cumulative evidence for thinking space filled with a ponderable medium of exceedingly minute density grows stronger every day. For the original suggestion of the modern ether, see Huygens' *Treatise on Light*, translated in Harper's *Scientific Memoirs*.

Ethics is the theory of conduct, so far as conduct may be judged as right and wrong. Ethics, then, means little more than morals. But the study of ethics may include that part of the theory of life which is involved in the explanation of the causes and effects of moral acts and the moral judgment.

The chief question which divides students of ethics is whether there be one unchangeable highest good, a *summum bonum*, or whether there be only *goods*. In a given set of circumstances, is there only one right or good mode of action? Or is it merely that one mode of action is more right, is better, than another? The same difficulty exists for the true and the beautiful. Are the true, the beautiful and the good fixed and absolute; or do they depend upon the use which is made of them and upon what a man carries with him to the thing that he judges? For if the good, the beautiful and the true are fixed and perfect, then ethics, like logic and the study of art, will take its place as a branch of philosophy. It will depend upon the reconstruction of experience as a whole. But if there be only goods, not good; truths, not truth; things beautiful, not beauty; then ethics may only be studied as a science. Its study will be the study of what has been judged good and bad and what is being judged good and bad; together with the natural grounds of the moral view that is taken in each case. The philosophical school of ethics tries to set up an ideal of good and thus a standard of right and wrong conduct; the scientific school seeks to content itself with facts alone.

Yet it may be possible to think of the ends or aims or goods of life as belonging to a system; so that there may be one ideal highest good, and yet within the system many goods. The system will be a growing and organic one, incomplete and unfinished, yet seeking perfection. Thus tragedy and the clash of right with right may be no more than a mode of the growth of the highest good. In this event, ethics may be both a philosophy and a science. The study of conduct as it exists is a science; the study of conduct as it tends to become is a philosophy.

But may ethics be only an art, and neither a science nor a philosophy? No; civilization affords no example of the practice of conduct without a theory. Ethics is indeed an art; but it cannot be merely an art. It must be grounded upon facts or else upon ideals. Clearly facts, or things done, and ideals, or things aimed at, both should have part and lot in ethics. Facts are nothing without values; ideals are idle and empty without facts. Therefore the student of ethics may do well to study writers of both types, scientific and philosophical. On the side of ethics as a science, he may begin with the *Data of Ethics* of Herbert Spencer; and on the side of philosophy with the *Prolegomena to Ethics* of the late T. H. Green. A lucid introductory work, like Mackenzie's *Manual of Ethics*, might precede these.

Upon the whole, the history of ethics has centered about the search for the standard of right and wrong, good and evil. Is pleasure the highest good? If so, whose pleasure? Is the highest good, as for Kant, duty? Or is it, as for Bentham

and Mill, the greatest good of the greatest number? Is it to serve others, or to realize the possibilities of the self? Green held it to be the realization of the self in a common good. Others hold that the standard is present utility; the future must take care of itself. To the believer in progress, there is an ideal eternal good; but because this is only *becoming*, there also is a temporary present good. These goods may clash; but only for the moment. According to this view, principles of ethics may hold good in general, but not rigidly; they may concede something to the moment, but beware lest they concede too much.

Ethio'pia (the Cush of the Bible), the name given to the countries south of Egypt and Libya, on the upper Nile. It included modern Nubia, Sennaar, Kordofan and Abyssinia. The name Ethiopian was originally given to all the nations inhabiting the southern part of the globe, or, rather, to all people of a dark-brown or black color. The word is supposed to come from two Greek words meaning sun-burned. The part of Ethiopia of which we have the most ancient knowledge is the kingdom of Meroë, an island formed by two rivers tributary to the Nile. Its capital was Napata. The island was very fertile, with an abundance of animals and metals. It also was the site of an oracle of Jupiter Ammon. This made it a great place of resort and a trading place for India, Arabia, Egypt, Libya and Carthage, so that it grew rapidly and became, about 1000 B. C., one of the most powerful kingdoms of the ancient world. It threw off the yoke of Egypt about 760, and in turn ruled Egypt for sixty years. At one time 240,000 Egyptians settled in Meroë, and, being artisans and traders, added to its prosperity. It was conquered by Cambyses about 530 B. C. The Ethiopians sent to Darius every third year four pints of gold-dust, 200 logs of ebony, five negro slaves and 20 tusks of ivory. Augustus conquered Meroë, and we find Queen Candace (Candace means the queen) of Ethiopia mentioned among his vassals. The remains of the ancient civilization of Ethiopia are the ruins of large buildings covered with sculptures representing battles and religious ceremonies, rows of broken sphinxes, temples hewn in the rocks and several pyramids, which are higher in proportion to their base than those of Egypt. The names of 30 kings and queens have been found, the first one, named Meneliheh, being said to be the son of Solomon and the queen of Sheba. The modern history of the country belongs to Abyssinia. The area is over 400,000 square miles, with an estimated population of over 5,000,000. See ABYSSINIA and NUBIA.

Ethnology. See RACES

Et'na or **Ætna,** a volcano on the eastern coast of Sicily, 10,850 feet high. It ends in a single cone, with a crater 1,000 feet deep and from two to three miles around. On the sides of the mountain are a large number of smaller cones, the chief being the Monti Rossi, twin peaks cast up in the eruption of 1669. The mountain rises through three zones—the cultivated region, of about 2,000 feet, where date-palms, bananas, oranges, lemons, olives, figs and almonds are grown; the wooded region in the middle, planted with forests of chestnut, cork, beech, pine, maple and oak; and the desert region beginning at about 6,300 feet from the base of the mountain, a dreary

MOUNT ETNA AS SEEN FROM REGGIO IN CALABRIA

waste of black lava, ashes and sand, covered through a large part of the year with snow. The famous chestnut-tree, one of the largest and oldest trees in the world, formed by seven trees grown together and 163 feet in circumference, is in the wooded region of the slope. Nine thousand and seventy-five feet above the sea an observatory was built in 1880, which is the highest inhabited house in Europe, being 1,000 feet higher than the shelter on the Great St. Bernard. The earliest recorded eruption of Mount Etna has no date, but seems to have happened before the Trojan War. The earliest date is 475 B. C. The most remarkable eruptions are the following: In 1169, when Catania with 15,000 citizens was destroyed; 1329, when a new crater was opened; 1444, when the cone fell into the crater; 1537, which overwhelmed two villages; 1669, when a chasm 12 miles long was opened and a new crater made. In 1852–53 there was an eruption, which lasted nine months and sent out a torrent of lava six miles long, two miles wide and 12 feet deep. There have been in all about 100 eruptions, 16 of them occurring in the 19th century. The ascent is usually made from Catania See *Etna and Its Eruptions*, by Rodwell

Eton College, a famous English school, situated in Eton, on the Thames, 22 miles from London. It was founded in 1440 by Henry VI. The governing body is nominated by the Universities of Oxford and Cambridge. Several scholarships at King's College, Cambridge, are filled every year by Eton scholars. The students number nearly 900. Bolingbroke, Canning, Chatham, Fielding, Fox, Hallam, Gray, Shelley, Wellington and Gladstone are on the list of its scholars. The buildings, of brick and stone, date from 1440 to 1889. The Gothic chapel is especially beautiful. The "montem," a procession of the students, which took place three times a year to Salt Hill, was one of the features of the school until 1846, when it was stopped. The boys marched to the hill, led by a captain, and spent the day, partaking of breakfast and dinner on the hill. They were visited by crowds of spectators, from whom they collected toll, called "salt," which amounted often to $5,000. See Maxwell Lyte's *History of Eton College.*

Etruria (*ê-trōō'rĭ-ȧ*) a division of ancient Italy, west of the Tiber and the Apennines and including the valley of the Arno. At one time it included also the valley of the Po and a region south of the Tiber. Modern Tuscany and some neighboring countries (part of Umbria) cover about the same region. Etruria proper was a union of 12 cities or cantons, each of which was independent. Veii, 11 miles from Rome and her rival for four centuries, covering 16 square miles and destroyed by Camillus in 396 B. C.; Cære, where is the tomb of the Tarquins, now the village of Cervetri; Cortona, perched upon a rock, the most ancient site in Italy; Tarquinii, 60 miles from Rome, now partly occupied by the town Corneto; Clusium; Perusia, now Perugia; and Volsinii, a once powerful city and one of the last to yield to Rome, are among the names of Etruscan cities that have come down to us. Etruria is represented as a powerful and wealthy state before Rome was founded. According to tradition, the Etruscan era commenced in 1044 B. C., nearly three centuries before that of Rome. With the beginning of history we find the Etruscans a great naval power, ruling over northern and central Italy, Rome itself being included in its dominion and governed by Etruscan kings. The great sewer, the Cloaca Maxima, the Capitoline temple and the Servian wall are remains of Etruscan rule in Rome. Many of the state ceremonies of Rome were of Etruscan origin; also the circus, the combats of the gladiators, the horse races and the triumphal processions. The arrangement of the houses, the building of aqueducts and sewers and the position of woman in the family can all be traced to the Etruscans. For a century after the overthrow of the Etruscan kings in Rome, Veii kept up a varying struggle. In 538 B. C. the Etruscans, with the Carthaginians, sent a formidable fleet to expel the Greek colonists from Corsica. They attacked the Greek colony of Cumæ in 525 B. C. and again in 474 B. C., when their naval power was shattered in a great battle, the first event of Etruscan history of which we possess a record of the time. In 476 B. C. the Etruscans were the greatest military power in Italy, but soon after that time they began rapidly to decline. The Samnites, Greeks, Gauls and Romans hastened the downfall of Etruria. In 280 B. C. the Romans reached Volaterræ, the northern stronghold of the Etruscans, and the long struggle of five centuries came to an end. The Etruscan cities kept their wealth and power as partly independent allies of Rome for a time. They gradually, however, became Roman cities, adopting Roman customs, and were finally admitted to the Roman empire in 89 B. C., while the great Etruscan families held leading positions in Rome.

The people of Etruria were called Etrusci by the Romans and Tyrrheni by the Greeks. They were a short, sturdy race, with large heads, thick arms, high color and black hair; a people so unlike the other Europeans, that Seneca said: "Asia claims the Etruscans as her own." Their origin is, however, unknown. From their monuments we learn that they had an extensive literature, composed of histories, poems and dramas; but their books have perished, and our only means of learning anything of their language is from inscriptions, of which there have been about 5,000 discovered. They excelled in medicine, astronomy, mining, metal-working and the building of roads and tunnels. The bronze statues of Etruria were famous; they filled the temples of Rome, and it is said that the city of Volsinii alone had 2,000 of them. The Chimæra, in the museum at Florence, and the wolf in the capitol at Rome and a magnificent lamp at Cortona are still preserved. The painted vases found in Etruscan tombs are probably of Greek workmanship. The tombs of the Etruscans were of two kinds, the stone-pyramid, with rooms, and the chamber cut in the rock. They were furnished, as their houses were, having chairs and vases, mirrors, pottery and jewelry, and the walls were decorated with scenes from their daily life or from the underworld. See *Cities and Cemeteries of Etruria,* by Dennis.

Eubœa (*ū-bē'ȧ*) is a long and narrow island on the eastern coast of Greece, separated from the mainland by a narrow channel. The island is fertile; indeed in the Greek its name signifies *rich in cattle.* Cattle, wool, hides, cheese, oil, milk and honey are the chief products. The island

has passed during historic times under the control of the Athenians, Macedonians, Romans, Turks and modern Greeks. In ancient times, when not dominated by Athens or Macedon, Eubœa was shared among seven city-states, of which the chief were Eretria and Chalcis. It now has a population of over 100,000.

Eucalyp'tus. A genus of the myrtle family, containing about 140 species, which are known in general as gum-trees. The species are all natives of the Australasian region, excepting a few which belong to the East Indies. They are mostly trees, and sometimes are of great size, commonly rising from over 100 feet to more than 400 feet in height. The wood is very durable and much used in Australia. The name gum-tree has been given because the bark of certain species yields a resin from which tannin is obtained in commercial quantities. *E. globulus* has come under wide cultivation, being often planted in swamps and malarial regions, which it is said to assist in draining and rendering more healthful.

Euclid (*ū'klĭd*), a mathematician, the Father of Geometry, was a Greek, born at Alexandria in Egypt and living about 300 B. C. Very little of his life is known except that he taught mathematics in the reign of Ptolemy I, who died in 283 B. C. He probably was the founder of the illustrious mathematical school at Alexandria. When Ptolemy asked him if there were not an easier way of learning geometry, he made the celebrated answer: "There is no royal road to geometry." His principal work is the *Elements*, in 13 books, portions of which are used in schools as a text-book of elementary geometry. It has been translated into many languages, and is probably better known than any other mathematical work. The first printed edition was translated from Arabic in 1482. It is still in use as a text-book in Great Britain. Besides the *Elements*, Euclid wrote the *Data*, a collection of 100 propositions in geometry, a book much valued by Newton, and *Phænomena* or appearances of the heavens. See *Euclid and His Modern Rivals*, by C. L. Dodgson.

Eugène (*ū-jēn'*), **François, Prince,** called Prince Eugène of Savoy, was one of the greatest generals of his time. He was born at Paris, Oct. 18, 1663. Louis XIV refused him a commission in the army, and he entered the service of the emperor of Austria. He rose rapidly in rank, becoming field-marshal in 1693. He defeated the Turks in the battle of Zenta, Sept. 11, 1697, which ended their power in Hungary. The War of the Spanish Succession, in 1701, found him in command of the Italian army, but his force was too small to achieve very much. As commander of the imperial army of Germany, he helped Marlborough to gain the victory of Blenheim (1704), and later he shared in the glory of the fields of Oudenarde (1708) and Malplaquet (1709). In the war against the Turks, in 1716, Eugène, with 64,000 men, defeated an army of 150,000, and in 1717 carried Belgrade by assault, receiving in the bloody struggle his 13th wound. In times of peace he was prominent in the councils of the nation at Vienna, where he died on April 21, 1736. He was worshiped by his soldiers and has since been regarded as a hero in popular song. He served under three emperors, and used to say that in Leopold I he had a father, in Joseph I a brother and in Charles VI a master. See *Prince Eugène of Savoy*, by Malleson.

Eugènie (*ē'zhā-nē'*), **Marie de Montijo,** ex-empress of France, was born at Granada, Spain, May 5, 1826, of Spanish and Scotch descent. Her beauty won Napoleon III, emperor of France, to whom she was married in 1853. A wedding present, in value about $12,000, from Paris, she used in endowing a college for women, and also gave to charities $20,000 out of her husband's gift. She made a voyage to Venice, Constantinople and Egypt, and was present at the opening of the Suez Canal. She was made regent when Napoleon was at the head of the army in 1870. When the news of his surrender at Sedan reached her, she fled after midnight with a few attendants, to England, where she was afterward joined by her son and husband. Her only son, Napoléon Eugène, was born on March 16, 1856, and was killed in the Zulu War in 1879. She died July 11, 1920.

Euphrates (*ū-frā'tēz*), the largest river of western Asia, rises in the heart of Armenia and flows south, breaking through the Taurus Mountains in a succession of rapids and cataracts for about 40 miles. At Kurna the Tigris joins it, and with the new name of Shatt-el-Arab it empties itself by several arms into the Persian Gulf, 1,700 miles from its source. It is navigable for small boats nearly 1,200 miles, and warships can ascend it for 120 miles. In ancient times, by a system of canals and embankments, the river was used for irrigating the country as the Nile is in Egypt; but the works are not kept up. The Euphrates is mentioned in the Bible as one of the four rivers of the Garden of Eden. It is called the "great river." The city of Babylon was situated on its banks, and Nebuchadrezzar had locks and dikes made to enable large vessels to ascend it as far as the city. See *The Euphrates Expedition*, by W. F. Ainsworth.

Eureka, Cal., county-seat of Humboldt County, 225 miles northwest of San Francisco. It is located in the famous redwood region, and its lumber interests are important. Near the city is Sequoia Park, a 40-acre tract of redwood forest. The city has good schools, newspapers, gas

and electric light and the service of three railroads. It is situated on Eel River and Humboldt Bay, and has a fine harbor, which the U. S. government has improved. Population, 11,845.

Euripides (*u-rip'i-dēz*), a famous Greek poet, was born in Salamis in 480 B. C. He was the last of the three great tragic poets of Greece. He was a pupil of Anaxagoras and a friend of Socrates. His first play was written when he was 18. He is said to have written from 75 to 90 dramas, of which we have 18 complete. *Alcestis*, *Medea*, *Hecuba*, *Andromache*, *Ion*, *Orestes*, *Iphigenia*, *Electra* and *The Bacchæ* are some of his works. Socrates admired his tragedies so much that he always went to the theater if a play of Euripides was performed, but Aristophanes made fun of him and charged him with degrading tragedy, by introducing in it scenes from every-day life. He left Athens for the court of Archelaus, king of Macedon, where he died in 406 B. C. When the news of his death reached Athens, the whole city was plunged in mourning. Sophocles, then 90 years old, made his actors wear mourning on the stage. The Athenians asked for the body of Euripides for burial, and when refused built a magnificent tomb to his memory on the road to the Piræus, with the inscription: "All Greece is the monument of Euripides. Macedonian earth covers but his bones." Archelaus also built a monument, and inscribed upon it: "Never, O Euripides, will thy memory be forgotten." His popularity increased after his death. His plays were much oftener revived on the stage than those of Sophocles or Æschylus. His works were favorites of Aristotle, Vergil, Ovid, Horace, Milton and Browning.

Europe is, historically and politically, the most important of the five great divisions of the world, though, next to Australia, the smallest in size, and is also the most densely populated. There have been several theories as to the origin of the name Europe. The old mythological one was that it was from Europa, who was carried off by Zeus; another that it came from *Eurus*, the southwest wind; and still another, that it means *Broad Land*. The latest suggestion is that the name was first given by the Phœnician traders from the word *Erebh*, meaning darkness, and applied to the country as the land of sunset or the west.

Geography. Europe has a total length, from Cape St. Vincent on the southwest to the mouth of Kara River on the northeast, of 3,400 miles, and is 2,400 miles broad from North Cape in Norway to Cape Matapan, the most southern point of Greece. Not including islands, the area of the continent is 3,800,000 square miles, being about one third that of Africa, a fourth of America and a fifth of Asia—not much exceeding the total area of the United States. Its indented coast-line, caused by its great irregularity and the number of deep inlets and gulfs, is more extensive, in proportion to its size, than that of either of the other great natural divisions of the globe, being about 40,000 miles. It is divided physically into two great portions—the great plain in the northeast and the highlands from near the center toward the southwest; the mountainous peninsula of Scandinavia lying apart from both. The plain occupies about two thirds (2,500,000 square miles) of the entire continent, reaching from the eastern boundary north to the Artic Ocean, south to the Caucasus and Black Sea and westward over the whole extent of the continent, gradually narrowing as it approaches its western limit. Its shape is triangular, the base resting on the eastern boundary and the apex on the shores of Holland. It separates the two mountain systems of Europe —the Scandinavian on the north (highest summit 7,566 feet) and the Pyrenees, Alps, Carpathian, Balkan and Caucasus ranges on the south. The mass of the Alps, with an area of nearly 100,000 square miles, forms the center of the mountain system of southern and western Europe, stretching down on the four sides toward France, Germany, Hungary and Italy, the highest summit being 15,732 feet. The other mountain ranges are the Pyrenees, 11,170 feet; Carpathians, 8343; Balkans, 9,750; Apennines, 9,574; and the Sierra Nevada, 11,660; and in Sicily, Etna, 10,850 feet. The observatory on Etna (9,075 feet) is, since 1882, the highest inhabited spot in Europe, being nearly 1,000 feet higher than the celebrated hospice on the Great St. Bernard. Europe is surrounded by water on three sides. The White Sea enters from the Artic Ocean; the German Ocean and the Mediterranean Sea enter from the Atlantic, Scandinavia in the north and Spain, Italy, Greece, Turkey and the Crimea in the south are the most important peninsulas. The chief islands are Iceland, Great Britain and Ireland, Nova Zembla, Sardinia, Corsica and Crete (Candia). The lakes are small as compared with America or Africa. The largest rivers are the Volga, 1,977 miles; Danube, 1,740; Ural, 1,450; Don, 1,125; Kama, 1,055; Petchora, 975; and the Rhine, 765. Previous to the World War (*q. v.*) the political divisions were:

Countries of Europe	Area in sq. miles	Population
Andorra	175	5,231
Austria-Hungary	241,333	49,418,598
Belgium	11,373	6,693,548
Bosnia-Herzegovina	19,800	1,895,673
Britain, United Kingdom	121,301	45,469,564
Bulgaria	38,080	4,284,844
Crete	3,330	310,400
Denmark (with the Färoes)	15,592	2,605,268
France	207,054	39,376,000
German Empire	208,780 (1910)	64,903,423

Countries of Europe	Area in sq. miles	Population
Greece	25,014 (1909)	2,666,000
Italy	110,550 (1910)	34,565,198
Lichenstein Principality	65	9,650
Luxemberg (Grand Duchy)	998	246,455
Monaco, Principality of	8	19,121
Montenegro	3,630	250,000
Netherlands, The	12,648 (1909)	5,898,429
Norway	124,129	2,392,698
Portugal (and Maderia and Azores)	35,490	5,423,137
Rumania	50,700	6,500,000
Russia in Europe (including Finland)	2,122,527	119,521,200
San Marino	38	10,489
Servia	18,650	2,492,882
Spain	194,783	19,503,068
Sweden	172,876	5,476,441
Switzerland	15,976	3,741,971
Turkey in Europe	65,350	6,130,200

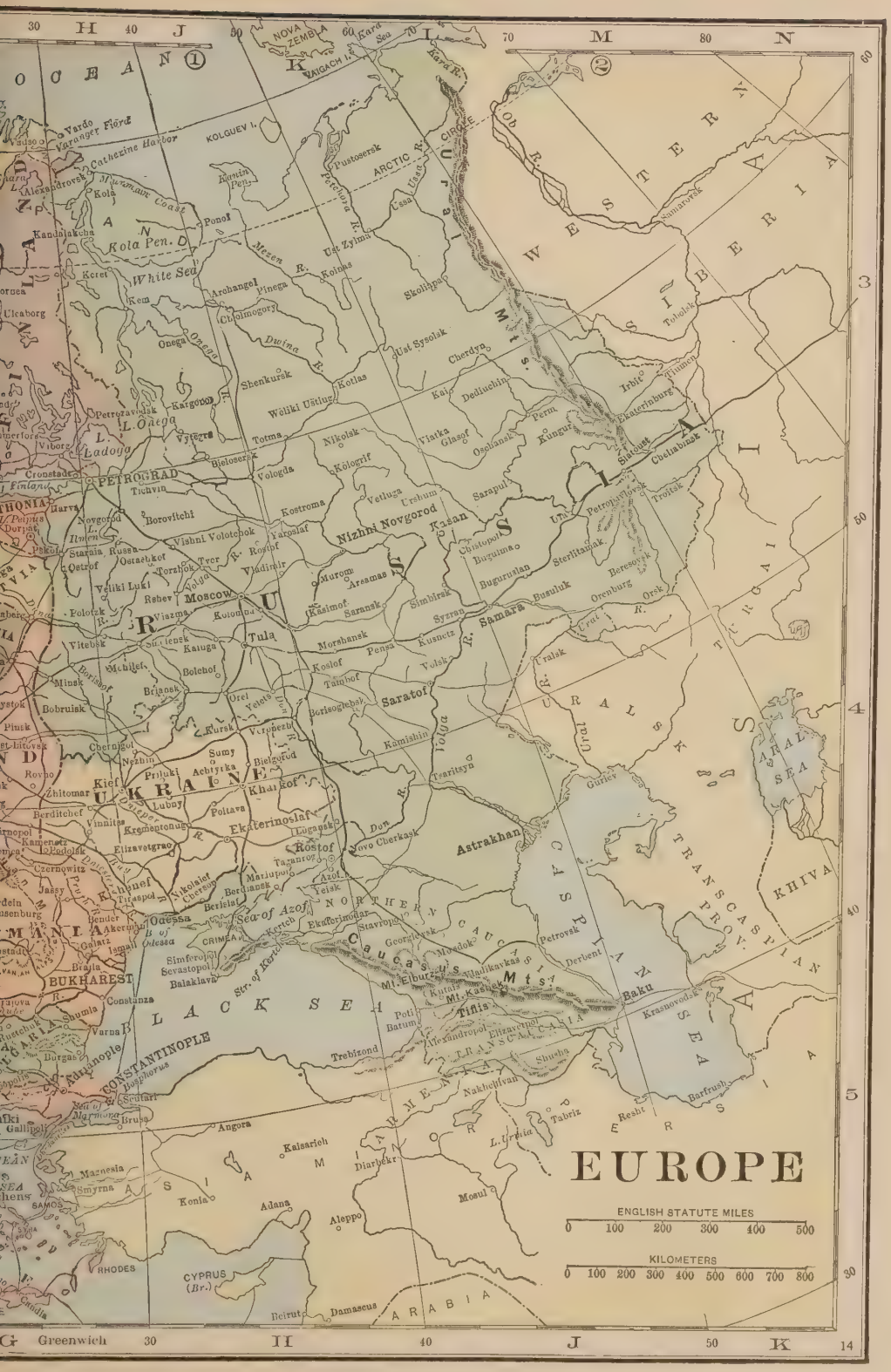
Natural History. The natural history of Europe agrees very much with that of the same latitudes of Asia. The climate of the larger part is temperate, though parts of Sweden, Norway and Russia lie within the artic circle; and portions of Spain, Sicily and Greece are about 12 degrees from the northern tropic. The temperature of western and northern Europe is raised by the Gulf Stream, the winds from the dry desert land in Africa and the large amount of moisture from the Atlantic above that found elsewhere in similar latitudes. The effect is so great that the northern limit of some plants is later reached on the Atlantic shores than in the more central parts of Europe, where the winters are much colder and the average temperature of the year is lower. Plants which require a mild winter will not grow in the north and scarcely even in the center of Europe; but they advance along the western coast under the influence of the ocean climate. The myrtle, though not native, grows in the south of England, the date-palm in the south of Europe; and among animals a species of ape is found on the rock of Gibraltar, while some strictly African birds are frequent visitors; and many birds, such as the swallow, cuckoo etc. are common to Europe and Africa, migrating in summer to northern regions and returning in winter to the warm south. Many of the plants found in the south of Europe have probably originally been brought from Africa or the east—the myrtle, vine, olive, orange, lemon, fig, peach, almond, apricot etc. are instances; while some are certainly natives of Europe, as for example, the apple, pear, plum and cherry. Among the wild animals at the present time the bison is still reckoned, and the ox at no very remote period. The reindeer inhabits the extreme north, while the elk, stag, fallow-deer and roebuck are dound further south; the ibex exists on the high central mountains; and there are two species of antelope, the Alpine chamois and the saiga of the Russian plains. Other animals are the civet, ichneumon, muskrat, porcupine, bear, foz, lynx and wolf. The fisheries of the European seas are valuable, more particularly the herring and cod in the north and the tunney, anchovy etc. in the Mediterranean.

Races. The European races mainly belong to the various branches of the great Aryan stock, though in few of the countries is there a pure race. Generally speaking, Celtic blood is most largely found in France, in the northern part of Great Britain and in Ireland. Teutonic peoples occupy Germany, Switzerland, the Netherlands, part of Belgium, part of Austria, Denmark, Norway, Sweden, Iceland and Great Britain. Slavonic races are found in Austria, Prussia, the Balkan peninsula and Russia. Romanic language and blood are prominent in Italy, France, Spain, Portugal and Roumania. The Greeks belong to the same branch of Aryans as the Italians. The non-Aryan peoples are the Finns, Lapps and Samoyeds of the north and northeast, various Turanian tribes in the east of Russia, the Hungarians, Turks and the Basques of the Pyrenees. The total population in 1914 was 442,000,000—giving an average of about 116 to each square mile. The best method of classifying the races comprising this grand total is language. Using this test, we find some 108,000,000 of Europeans were Teutonic; over 95,000,000 Slavs (Russian, Polish, Czech, Croat, Serb, Slovak, Slavonian and Bulgarian); nearly 100,000,000 Romance-speaking peoples (French, Italian, Spanish, Portuguese, Rumanian, Walloon, Rhætian); 3,000,000 Letts and Lithuanians; 5,250,000 Greeks and Albanians; 4,739,569 Celtic (Welsh, Breton, Irish, Gaelic, Manx); 1,050,000 Armenians, Ossetians and Gypsies. Some 18,000,000 are non-Aryan (Magyars, Finns, Ugrians, Tartars, Turks, Kalmucks, Basques, Circassians, etc. and Maltese). Upward of 50 languages are spoken in Europe.

Religions. In religion, Europeans are largely Christians, though there are Buddhiss Kalmucks in southern Russia and pagant among the Lapps, Finns, Samoyeds and Tcheremisses. The Turks, many Albanians and some Russian Tartars and Slavs are Mohammedans (6,629,000). There are 6,456,000 Jews. The Roman Catholic church has 160,165,000 adherents, the Greek church 89,196,000, while the various Protestant churches include about 80,812,000.

The early history of Europe is that of Rome, Greece and the Byzantine empire, (which see). On the death of Theodosius (395 B. C.) the Roman empire was divided finally into two parts; the Latin empire or Empire of the West, with Rome as its capital; and the Greek empire or Empire of the East, the capital of which was at Constantinople. Beyond the boundaries of the Roman world was a great barbaric people, divided into two

Hammond's 8 x 11 Map of Europe.
Copyright by C.S.Hammond & Co.,N.Y.
Longitude D West 0 E 10 Longitude F East 20
Strait of Denmark
ICELAND
ARCTIC CIRCLE
FAROE IS. (Den.)
SHETLAND IS.
ORKNEY IS.
HEBRIDES
BRITISH ISLES
NORTH SEA
ATLANTIC OCEAN
BAY OF BISCAY
LONDON
Paris
Brussels
Hague
Amsterdam
Berlin
Copenhagen
Christiania
Bergen
Stockholm
Gottenborg
Hamburg
Munich
Vienna
Budapest
Prague
Zurich
Berne
Milan
Genoa
Marseille
Barcelona
Madrid
Lisbon
Porto
Seville
Malaga
Gibraltar (Br.)
Rome
Naples
Palermo
Valetta
MALTA (Br.)
CORSICA
SARDINIA
Cagliari
Tunis
Algiers
Oran
Constantine
Melilla
Tangier
MOROCCO
ALGERIA
AFRICA
MEDITERRANEAN SEA
TYRRHENIAN SEA
IONIAN SEA
ADRIATIC SEA
Str. of Gibraltar
Str. of Messina
Str. of Bonifacio
Pyrenees
Alps
Danube R.
Rhine R.
Tiber R.
Vesuvius
Etna
Sierra Nevada
Sierra Morena
Sierra de Guadarrama
Balearic Is.
Majorca
Minorca
Ivica
Malta
Sicily
Sardinia
Corsica
Crete
Cyprus
Rhodes
Lofoten Is.
Jan Mayen
Iceland
Hekla
Vatna Jokull
Myrdal Jokull
Hvannadalshnjuk
Dyrfjoll
Eyjafjoll
Thistill F.
Berufjoll
Diupivogr
Reykjavik
Faxa F.
Breidi F.
Hunafloi Fiord
North C.
C. Reykjanes
C. Langanes
Vestfjord
Tromsoe
Bodoe
Vik
Trondhjem
Christiansund
Molde
Dovrefield
Herjosandt
Sundsvall
Soderhamn
Falun
Gefle
Stockholm
Linkoping
Jonkoping
Visby
Gotland
Oland
Karlskrona
Helsingborg
Halmstad
Kalmar
Aalborg
Aarhus
Esbjerg
Ribe
Flensburg
Kiel
Lubeck
Hamburg
Altona
Stettin
Danzig
Lodz
Breslau
Dresden
Leipzig
Chemnitz
Zwickau
Erfurt
Cassel
Hanover
Brunswick
Hamburg
Bremen
Emden
Wilhelmshaven
Cuxhaven
Helgoland
Weser R.
Elbe R.
Rhine R.
Cologne
Frankfurt
Mainz
Mannheim
Karlsruhe
Nuremberg
Augsburg
Stuttgart
Ulm
Munich
Innsbruck
Salzburg
Linz
Budweis
Prague
Brunn
Vienna
Bratislava
Gratz
Agram
Fiume
Trieste
Udine
Verona
Milan
Turin
Genoa
Pisa
Leghorn
Rome
Naples
Bari
Brindisi
Durazzo
Cetinje
Sarajevo
Zara
Spalato
Ragusa
Salonika
Sofia
Belgrade
Nish
Bucharest
Constantinople
Smyrna
Athens
Corinth
Patras
Valetta
Palermo
Messina
Catania
Syracuse
Taranto
Cosenza
Reggio
Cagliari
Sassari
Oristano
Palma
Ibiza
Alicante
Cartagena
Almeria
Granada
Malaga
Cadiz
Jerez
Seville
Huelva
Badajoz
Caceres
Salamanca
Zamora
Valladolid
Burgos
Vitoria
Santander
Oviedo
Coruna
Ferrol
Vigo
Oporto
Coimbra
Lisbon
Setubal
Evora
Beja
Faro
Tamira
Cuenca
Toledo
Ciudad Real
Albacete
Murcia
Valencia
Castellon
Tortosa
Tarragona
Lerida
Gerona
Saragossa
Pamplona
Jaca
Huesca
Toulouse
Montpellier
Nimes
Perpignan
Bordeaux
Rochefort
Nantes
Angers
Le Mans
Rennes
Brest
St. Nazaire
Cherbourg
Caen
Rouen
Havre
Amiens
Versailles
Orleans
Tours
Poitiers
Limoges
Angoulême
Clermont
Lyon
Grenoble
Dijon
Besançon
Troyes
Nancy
Metz
Strasbourg
Mulhouse
Basel
Lucerne
Geneva
Lausanne
Bern
Zurich
Coblenz
Bonn
Cologne
Aachen
Liege
Namur
Mons
Lille
Calais
Boulogne
Dieppe
Le Havre
Cherbourg
Nice
Toulon
Marseille
Avignon
Montpellier
Perpignan
Bayonne
Biarritz
Pau
Lourdes
Tangier
Melilla
Fez
Algiers
Oran
Constantine
Tunis
Sfax
Tripoli
Bizerta
Malta
Valetta
Gibraltar (Br.)
Cadiz
Malaga
Almeria
Cartagena
Alicante
Valencia
Barcelona
Madrid
Lisbon
Porto
Coimbra
Setubal
Evora
Beja
Faro
Seville
Huelva
Badajoz
Caceres
Salamanca
Zamora
Valladolid
Burgos
Vitoria
Santander
Oviedo
Coruna
Ferrol
Vigo
Cuenca
Toledo
Ciudad Real
Albacete
Murcia
Tarragona
Tortosa


EUROPE
ENGLISH STATUTE MILES
0 100 200 300 400 500
KILOMETERS
0 100 200 300 400 500 600 700 800
Greenwich
WESTERN SIBERIA
ARCTIC CIRCLE
NOVA ZEMBLA
KOLGUEV I.
Kola Pen.
White Sea
Archangel
Onega
Ladoga
PETROGRAD
Moscow
Nizhni Novgorod
Kazan
Samara
Saratof
Tula
Kiev
Kharkof
Ekaterinoslaf
Rostof
Astrakhan
Odessa
Sea of Azof
BLACK SEA
CASPIAN SEA
Caucasus Mts
Tiflis
Baku
Krasnovodsk
Kuban R.
Don R.
Volga R.
Ural R.
Ob R.
Dwina R.
Mezen R.
Petchora R.
Kama R.
Dnieper R.
Dniester R.
Pruth R.
Danube R.
Bosphorus
Sea of Marmora
CONSTANTINOPLE
Adrianople
BUKHAREST
Constanza
Varna
Brusa
Angora
Kaisarieh
Diarbekr
Mosul
Aleppo
Damascus
Beirut
Adana
Konia
Smyrna
Magnesia
Gallipoli
Trebizond
Tabriz
Resht
Barfrush
Shusha
Nakhchivan
Tiflis
Kutais
Batum
Poti
Sevastopol
Simferopol
Balaklava
Kertch
Taganrog
Berdiansk
Mariupol
Yeisk
Stavropol
Ekaterinodar
Petrovsk
Derbent
Vladikavkaz
Mozdok
Kursk
Voronezh
Orel
Tambof
Saratof
Kazan
Perm
Ekaterinburg
Tobolsk
Irbit
Kungur
Ufa
Orenburg
Uralsk
Guriev
Astrakhan
Tsaritsyn
Kamishin
Saratof
Samara
Simbirsk
Kasimof
Murom
Arzamas
Nizhni Novgorod
Kostroma
Vologda
Bielozersk
Totma
Vyatka
Glasof
Osolansk
Kolomna
Smolensk
Kaluga
Bolchof
Briansk
Minsk
Bobruisk
Pinsk
Vitebsk
Polotsk
Rshev
Viazma
Tchudovo
Novgorod
Borovitchi
Vishni Volotchok
Tver
Torzhok
Vladimir
Yaroslaf
Rostof
Ostrof
Pskov
Narva
Reval
Helsingfors
Viborg
Ladoga
Petrozavodsk
Kargopol
Onega
Kem
Kola
Kandalaksha
Varanger Fiord
Vardo
Catherine Harbor
Alexandrovsk
Ponoi
Mezen
Ust Zylma
Pinega
Kotlas
Shenkursk
Waliki Ustiug
Skolitsa
Ust Sysolsk
Cherdyn
Kaiu
Dediuchino
Vetluga
Urshum
Kologrif
Nikolsk
Sarapul
Osolansk
Chistopol
Bugulma
Bugurusian
Sterlitamak
Busuluk
Beresovsk
Orenburg
Orsk
Ural R.
Uralsk
Guriev
Tchelabinsk
Troitsk
Petropavlovsk
Ekaterinburg
Irbit
Tobolsk
Samarovsk
Ob R.
Kara R.
Kara Sea
Vaigach I.
Pustozersk
Petchora R.
Usa
Usa R.
Kola Pen.
Kandalaksha
Kem
Onega
Dwina R.
Vyatka
Kama R.
Volga R.
Don R.
Kuban R.
Dniester R.
Pruth R.
Danube R.
Dnieper R.
Pripet R.
Bug R.
Vistula R.
Niemen R.
Dwina R.
Pinsk
Bobruisk
Minsk
Mohilev
Bolchof
Briansk
Orel
Kursk
Voronezh
Tambof
Saratof
Kamishin
Tsaritsyn
Astrakhan
Guriev
Uralsk
Orenburg
Samara
Kazan
Nizhni Novgorod
Kostroma
Vologda
Bielozersk
Totma
Vyatka
Glasof
Osolansk
Kungur
Perm
Ekaterinburg
Irbit
Tobolsk
Tchelabinsk
Troitsk
Petropavlovsk
Ufa
Sterlitamak
Busuluk
Beresovsk
Bugulma
Chistopol
Bugurusian
Simbirsk
Syzran
Saratof
Samara
Kasimof
Murom
Arzamas

parts; the German or Teutonic, next to the western empire; and the Slavonic or Scythian, next to the eastern. The German barbarians were divided into tribes and nations: Goths, Burgundians, Alamanni, Vandals, Longobards, Franks, Angles, Saxons, etc. Farther away were the nomadic Alans. The Slavs, ancestors of the modern Russians, Poles and others, lived farther east and took small share in the history of the time. The Gothic tribes were mostly found in the region between the Vistula, Danube, Black Sea and the Don. This region was invaded by the Huns from Central Asia, and its inhabitants pushed westward, causing the great Gothic invasion. Gaul was overrun chiefly by Visigoths, Burgundians and Franks; Spain by Vandals, Suevi and Visigoths; Africa by Vandals, crossing from Spain. Italy suffered a number of invasions; and Britain, even before being abandoned by its Roman garrison, became as early as 367 a prey to Angles and Saxons. In the latter part of the 8th century the Frankish empire of Charlemagne extended from the Ebro to the Elbe and from the North Sea to Rome, the Franks having conquered both the Goths of France and the Burgundians. The two great divisions of Neustria (the kingdom of the west Franks) and the Austrasia (the kingdom of the east Franks, Franconia, not at all corresponding to what was later known as Austria) became the starting-points of the kingdoms and nations of France and Germany. Where Hungary is now were the Avars, while to the east of the northern portions of the Frankish realms was the region of Slavonia. Nothing but the little kingdom of Asturia was left of the Gothic power in Spain; the rest formed the Moslem sultanate of Cordova, the Mohammedans having established themselves in Spain in 711. Most of England and part of Scotland were now occupied by the English or Anglo-Saxons. The eastern empire had considerably diminished. In the 12th century the kingdom of the east Franks was the successor of the western empire, known as the Germanic or Holy Roman empire, extending from the North Sea to the states of the church under the dominion of the popes. In southern Italy was the Norman kingdom of Sicily. Henry II of Anjou was king of England and lord of Normandy, Anjou, Brittany and Aquitaine; the remainder of France being a kingdom under the successor of the kings of the west Franks. In Spain the Christian kingdoms of Leon, Castile and Aragon were growing at the expense of the sultanate of Cordova. Poland and Russia became consolidated states, the heathen Prussians and Lithuanians being their northern neighbors. The Hungarians were in their present dominions; Bulgaria and Servia on the north still limited the decreasing Eastern empire, which on the east was threatened by the Seljuk Turks.

At the Reformation, in the 16th century, Charles V was not only emperor of Germany, but king of Spain (the Moslems having been driven out from their last strongholds in Granada), Sardinia, Sicily and Naples, and ruler of the Netherlands and the county of Burgundy. Ferdinand I, archduke of Austria and afterward emperor, obtained by marriage Silesia, Bohemia and a part of Hungary, the rest belonging to Turkey. At the end of the Thirty Years' War (1648) the power of the empire was weakened, while that of France increased, she having acquired most of the kingdom and duchy of Burgundy—she absorbed the country in 1674—and seized Strassburg and its territory in 1681. Savoy was becoming an Italian power. Spain still held the Spanish Netherlands and a great part of Italy. The Protestant Netherlands and Switzerland became independent States. Sweden was one of the great powers, having acquired territories from Germany, Poland and Russia. The ancient possessions of Denmark, in the northern peninsula, Sweden acquired in 1658. The duchy of Prussia became independent of Poland in 1647. Early in the 16th century Poland had been one of the most powerful states of Europe. a great part of Russia being under its sway. She now lost in power and territory, while Russia steadily grew. Turkey held part of the former Eastern empire, the Austrian princes the remainder. Venice was the most important native Italian power, and Genoa held Corsica till 1768.

Before the French Revolution Poland had ceased to exist as a state; Prussia had risen to greatness and Russia's territory had increased largely; while Sweden had lost the leadership of northern Europe. The Spanish Netherlands belonged to Austria since 1713; and French Bourbons held the parts of Italy that had been Spanish. The French Revolution began a series of changes ending in the extension of Napoleon's empire over Germany west of the Rhine, great parts of northern Germany, the Netherlands and most of Italy; a portion being directly united with the empire; another held separately by Napoleon himself as his kingdom of Italy; while his brother-in-law was king of Naples, and his brother king of Spain. After the fall of the empire France retired within her old limits; the smaller German princes formed a loose confederation, of which Austria assumed the presidency. Italy was parceled out among despotic princes, the Venetian dominions becoming Austrian. The Netherlands became once more a kingdom, but finally separated into Holland and Belgium.

The chief events in European history since the middle of the 19th century have been the uniting of the German states in one empire under the headship of Prussia, the taking by force of Alsace-Lorraine from France at the close of the Franco-Prussian War (*q.v.*); the retirement of Austria out of Germany and her re-organization as the Austro-Hungary Monarchy; the formation of the Italian Kingdom; the lessening of Turkish territory after the different Balkan States secured their independence and the great World War (*q. v.*) which began in 1914.

For some years preceding the war the features of special interest and significance in the history of Europe were the growing sentiment in England and France and some other countries in Europe for a reduction of expenditure on armies and navies accompanied by the proposal which led to the establishment of The Hague Tribunal (*q.v.*) for the reference of all international disputes to arbitration.

Books without number have been written on the history of Europe and the various nations composing it. Among those of special interest may be mentioned: Bonner, *Child's History of Greece;* Church, *Greek Life and Story;* Grote, *History of Greece;* Mahaffy, *Greek Life from Alexander to the Roman Conquest; The Greek World under Roman Sway; Old Greek Education; Old Greek Life* (History Primers); *Problems in Greek History; Social Life in Greece from Homer to Menander; Survey of Greek Civilization;* Robinson, *Short History of Greece;* Arnold, *History of Rome; The Later Roman Commonwealth; The Second Punic War; History of the Roman Republic;* Bonner, *Child's History of Rome;* Church, *Roman Life in the Days of Cicero;* Falke, *Greece and Rome, their Life and Art;* Fowler, *The City-State of the Greeks and Romans; Roman Festivals in the Period of the Republic;* Gibbon, *Decline and Fall of the Roman Empire;* Mommsen, *History of Rome;* Yonge, *Young Folks' History of Rome;* James, *History of Chivalry;* Michaud, *History of the Crusades;* Burckhardt, *Civilization of the Renaissance in Italy;* Chatfield, *History of the Darker Ages; The Boy's Froissart;* Green, *Town Life in the Fifteenth Century;* Hallam, *Europe during the Middle Ages;* Bryce, *The Holy Roman Empire;* Draper, *Intellectual Development of Europe.*

Evangeline, a beautiful pastoral poem published by Longfellow in 1847, deals with the loves of Evangeline and Gabriel. They are parted through the removal of the Acadians from Nova Scotia by the British government, and only meet many years later at the death-bed of Gabriel. The poem is written in hexameters; and is one of the most successful poems written in this style in English.

Evans, Rear-Admiral Robley Dunglison, was born in Floyd County, Va., Aug. 18, 1846, and was educated at the Naval Academy. He was first attached to the West India, and subsequently to the North Atlantic, squadron, and took part in January, 1865, in the attacks on Fort Fisher, in which he was twice wounded. He subsequently served on various cruisers, and was in command of the *Yorktown* at Valparaiso, Chile, during diplomatic disputes between that government and the United States. He later had command of the battleships *Indiana* and *Iowa,* and in the latter did excellent service in the bombardment of the forts of San Juan, Porto Rico, and took part (July 3, 1898) in the naval battle off Santiago de Cuba. He was made rear-admiral in 1901, was placed in command of the Asiatic fleet of the American navy, and in 1904 was assigned to the command of the Atlantic fleet. He was in command of the fleet of 16 battleships which sailed from Hampton Roads in Dec. 1907, passed around South America to the Pacific, and arrived at San Francisco in April of 1908. He was familiarly known to seamen as "Fighting Bob." He died Jan. 3, 1912.

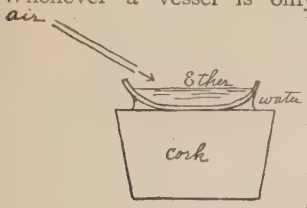
REAR-ADMIRAL EVANS

Evanston, Ill., a rapidly progressing city in Cook County, on Lake Michigan, practically a suburb of Chicago, and lying 12 miles north of the City Hall. It is the seat of Northwestern University, connected with which is Cumnock School of Oratory Swedish, Danish and Norwegian Theological schools and a public and a parochial system of education are maintained; also Garrett Biblical Institute. There are many attractive suburban residences of Chicago merchants, numerous churches and a delightful social life. The population is about 30,000.

Evansville, Indiana, capital of Vanderburg County, a railroad center and a port of entry on the Ohio, about halfway between Louisville and Cairo. It has handsome government buildings, 4 public libraries, an art-gallery, excellent schools, about 50 churches and a Junior High School System of long standing. Coal is plentiful there, and the town has 400 factories, employing 11,000 workmen. These establishments produce plows, furniture, cotton and woolen goods, malt liquors, saddlery, harness, pottery, etc. Besides, the city has a large trade in tobacco, flour and other staples. Evansville is noted for its many flour-mills and large output; but especially for its extensive manufacture of the product of its great hardwood-lumber trade. Its commercial importance is aided by its central situation, which makes it the chief shipping

point in Southwestern Indiana. Population, 85,000.

Evap'oration is the process by which a liquid body changes into a gaseous body. Whenever a vessel is only partly filled with a liquid substance, it is found that the remainder of this vessel always contains some of this substance in a gaseous form. This gas is called vapor.



EVAPORATOR

If the vessel be closed, it is found that, at any one temperature, this process of evaporation will go on until the vapor exerts a certain definite pressure—known as the vapor-tension of that substance at that temperature. What is very curious is that this vapor-tension is independent of any other gases that may be present over the liquid. It is not to be supposed that evaporation ceases when the vapor pressure reaches a maximum; but rather that, at this point, as many particles are leaving the vapor to enter the liquid as are leaving the liquid to enter the vapor. The rate at which evaporation proceeds depends very greatly upon the amount of vapor already present over the liquid. Accordingly, anything which diminishes the amount of vapor already over the liquid will increase the amount of evaporation. It is in this manner that a spoonful of tea may be cooled by blowing over it. For by blowing away the vapor we increase the evaporation. Since the average kinetic energy of a particle of vapor is very much greater than the average kinetic energy of a particle of liquid, it is clear that evaporation must rob the liquid of energy and thus cool it. If a watch-glass be placed on a cork with sulphuric ether on the glass and water underneath the glass, as shown in the figure, the water may be frozen almost immediately by simply blowing a steady stream of air over the surface of the ether. The vapor-tension of ether is high even at ordinary temperatures, so that evaporation is rapid. Since the latent heat of the vapor is derived from the heat in the ether, glass and water, the water is quickly frozen.

Another method of increasing evaporation is to increase the surface of the liquid. A pint of water in a large flat pan will evaporate much more rapidly than the same amount of water in an ordinary tin cup. Still another method of hastening evaporation is to place the liquid under the receiver of an air-pump and pump the vapor off. Strong sulphuric acid, which greedily absorbs water-vapor, will act in the same way. By combining these two methods (*i. e.*, placing both water and suphuric acid under the receiver of an air-pump) Leslie succeeded in freezing the water by evaporating it at the expense of its own heat.

Sometimes a solid evaporates directly without passing through the liquid state. Such a process is called sublimation. This is easily observed in the case of camphor and iodine. When a liquid is heated to the point where evaporation is no longer confined to the surface of the liquid but begins in the interior of the liquid, we call the process ebullition, or boiling. The temperature at which this occurs is called the boiling point. Evidently the boiling point may also be defined as that temperature at which the vapor-tension of a liquid is equal to the pressure of the atmosphere.

Ev'arts, William Maxwell, American lawyer and statesman, was born at Boston, Feb. 6, 1818, and died at New York city, Feb. 28, 1901. He graduated at Yale, and was admitted to the New York bar in 1841, where he built up a notable practice,—receiving as high as $50,000 for an opinion in a case. He was chief counsel for President Johnson in the impeachment trial in 1868, and was United States attorney-general to the close of Johnson's administration. He was United States counsel before the Alabama tribunal in 1872, and senior counsel for Henry Ward Beecher in 1875. In 1877–81 he was secretary of state, and United States senator for the term 1885–91.

WILLIAM M. EVARTS

Ev'erest, Mt., a peak of the Himalayas, in Nepal, is the highest point yet found on the earth, rising to an elevation of 29,002 feet above the sea. It was named in honor of Sir George Everest, surveyor-general of India.

Ev'erett, Edward, American statesman and orator, was born at Dorchester, Mass., on April 11, 1794. He graduated at Harvard College with the highest honors at the age of 17, where he had been the principal editor of the *Harvard Lyceum*, one of the first college papers founded in the country. When but 19, he became pastor of Brattle Street Church at Boston. He was appointed professor of Greek at Harvard, took a two years' course of study at Göttingen University in preparation for it, and entered upon his work in 1819. He delivered a course of lectures in the university on Greek literature and art, which

was so popular that he repeated them in Boston to large audiences. He wrote over 100 articles for the *North American Review*, of which he was editor for a few years. When he was elected to Congress, in 1824, his public life began. He served ten years, holding positions on important committees most of the time. From 1835 to 1839 he was governor of Massachusetts, and in 1840 was sent to England as minister of the United States. He secured for American seamen the right to fish in the Bay of Fundy, this being the first agreement between England and America on the subject of the fisheries. In 1845-48 he was president of Harvard College. He was secretary of the state for a few months, and again senator from Massachusetts for a short time, and was nominated for vice-president in 1860. His long course of public addresses and lectures, which made him so well known, began in 1824 with an address before the Phi Beta Kappa Society at Harvard College. In 1853 he prepared his address on *Washington* for the benefit of the Mount Vernon Association. It was delivered first before an immense audience in Boston, and repeated in different cities and states nearly 150 times. He also wrote a weekly article for the *New York Ledger*, realizing $10,000 for the benefit of the same association. Not including his expenses and his time, Mr. Everett gave $100,000 to the Mount Vernon fund. In 1863 he delivered an address at the dedication of the national cemetery at Gettysburg. He died at Boston, Mass., January 15, 1865.

Ev'erett, Mass., a flourishing city in Middlesex County, Mass., adjoining Boston and reached from it by a branch of the Boston and Maine Railroad and also by electric cars. Prior to 1870 it formed part of Malden, but in 1893 it was separately incorporated. It possesses good schools, churches and many fine residences of Boston merchants. Its industries include extensive chemical works, manufactories of rope, wheels, baby-carriages, and gas, coke and steel works. It also has two good public libraries. Population (which has increased rapidly in the past decade) 33,484.

Everett, Wash., the county-seat of Snohomish County, about 35 miles north of Seattle on Puget Sound. The surrounding region is an agricultural, lumbering and mining section. Among its leading industries are saw and paper mills, railroad and machine shops, shipyards and the manufacture of lumber products, etc. Everett has fine public schools and a public library, a hospital, and located here are the United States customs and assayer's offices. The city was settled in 1891, but its fine harbor and excellent railroad facilities have aided in its rapid growth to a substantial and modern city of about 30,000 population.

Ev'erglades. A large, shallow lake or marsh in southern Florida, 160 miles long and 60 broad. It incloses thousands of islets, which have a very rich soil and are covered with dense thickets, and contain great numbers of alligators. From this district Florida is sometimes called the Everglade State.

Evolution. Although evolution is a word in constant use, there still is great vagueness in the minds of most people as to what it stands for. In its broad sense it has come to mean the development of all nature from the past. If we think of the long train of events in the formation of the world and peopling it with life, we may look upon this story, figuratively, as written on a scroll that is being unrolled. Everything that has come to pass is on that part so far unrolled, and everything in the future is still covered but will appear in due course of time. Thus, evolution in its broadest sense may mean the unrolling of the scroll of the universe, including the formation of stars, solar systems and the elements of the inorganic world as well as of all living nature. But the word as usually employed is limited to organic evolution, or the formation of life upon our planet, and in this sense it is used throughout this article. It is a common mistake to suppose that Darwinism and evolution are the same, and there also is much misunderstanding as to the nature of the entire question. Hence we should first get a clear idea of what evolution is, then of the basis upon which it rests, and finally trace the growth of evolutionary thought, especially in the 19th century. Evolution, as used in biology, is a history of the steps by which animals and plants came to be what they are. The great variety of animals and plants is amazing. The water, the earth, the air teem with life; the fishes of the sea are almost innumerable; and in a single group of the insect world — the beetles — there are upwards of 50,000 species known and described. In addition to the living animals, there is entombed in the rocks a great multitude of forms that lived eons ago and became extinct. In view of all these forms the question comes at once to the mind: How shall we account for this great diversity of organic life? Have the great variety of forms existed unchanged from the days of their creation to the present, or have they, perchance, undergone modifications, so that one original form may have, through its descendants, emerged into different kinds? This is not merely an idle question, insoluble from the very nature of the case, for the present races of animals and plants have a long lineage reaching into the past, and it is a historical question to be answered by trying to discover their parentage. We shall see that there is good reason to believe

that the higher animals have been derived gradually from simpler ones, including with the higher animals, also, the body of man. The very general acceptance of this view in the latter part of the 19th century, under the title of the doctrine of evolution, has made an epoch. It has had great influence, perhaps the greatest of any one doctrine, in modifying the point of view in many fields of thought. It is, therefore, so important that all intelligent people ought to know what the doctrine is. By way of clearing the ground it may be repeated that it is not a question of creation through Divine agencies or non-creation, but a question of method of creation. It is not a theological question, but an historical one. Nevertheless, when the doctrine arose with new force about 1860, it found itself in conflict with theological ideas and especially with the doctrine of creation called special creation. It is natural to think that the latter was a view held by the early theologians and Fathers of the church, but it is instructive to find that some of them, such as St. Augustine, openly expressed the opinion that God created all things "in the germ." The doctrine of special creation was introduced into English Protestant thought through the epics of John Milton, to whose forceful and picturesque language we have been indebted for many of our accepted dogmas, without having paused to examine into them.

The question of the parentage of animals involves the distant past. The very center of it is this: Are species fixed and permanent, as Linnæus, the great Swedish botanist and naturalist, supposed; or do they change? If it can be shown that species (or particular kinds of animals and plants) change so much as to be recognized as different kinds, then there has been evolution. If, on the other hand, the evidence shows that species are fixed, there has been no evolution. It is well-known that by cultivation we can produce varieties of flowers, and by breeding we can produce different kinds of pigeons, fowl, and stock. Therefore, living beings may change through changes in their surroundings. But we must bring the history of past ages to bear upon the question. Fortunately there are preserved in the rocks the petrified remains of animals, showing their history for many thousands of years, and we may use them to test the question. It is plain that rocks of a lower level were deposited before those that cover them. Now, in Slavonia we have some fresh-water lakes that have been drying up from geological times. All through the ages these waters were inhabited by snails, and the first formed ones were parents of the later broods. As the animals died, their shells fell to the bottom and were covered by mud and débris, and held there like currants in a pudding. In the course of ages these layers thickened and were changed into rock, and thereby we have shells preserved in their proper order of birth and life, the most ancient ones at the bottom and the newest at the top. We can sink a shaft or dig a trench, and collect the shells and preserve them in proper order. Those nearest the top are descended from those near the bottom, but are very different. No one would hesitate to name them different species, in fact naturalists made six or seven different species when these shells were first examined. If, however, the whole collection were laid out in a long row in proper order, while those at the ends would be very different, if we begin at one end and pass to the other, the shells all grade into one another by such slight changes that there is no line showing where one kind leaves off and another begins. This shows their history for thousands of years. The species have not remained constant, but have changed into other species. We have other examples of similar conditions in Württemberg, which show that shells may change not only into different species but into different genera so gradually that one cannot tell where to separate one kind absolutely from another. But we have more perfect and more remarkable series than those mentioned, involving higher animals. For example, there is contained in the rocks of our western states the complete history of the horse-family—written as it were on tablets of stone—and extending over a period of more than 2,000,000 years. Geologists can, of course, measure the thickness of rocks and form some estimate of the time it took to have them deposited, for the rocks that lie in layers or strata were deposited layer by layer, usually by water. In the deposits near the surface we can find remains of the immediate ancestors of the horse of to-day, and there is but little change. In lower rocks we can come upon the forms from which these were derived, and so on, as long as the record holds out. If in this way we go into the past a half-million years, we find the ancestors of the horse reduced in size and with three toes on the fore and hind feet. The horse has now only a single toe on each foot, but small splint-like bones that represent the rudiments of two more. If we go back 1,000,000 years, we find three toes and the rudiment of a fourth, and, going back 2,000,000 years, we find four fully developed toes and bones in the feet to support them. It is believed that in still older rocks a five-toed form will be discovered, which was the parent of the four-toed form. To sum up this evidence: The parentage of the horse is surely from animals with four (and possibly five) toes, not like the horse of the present day. Therefore, horses have been evolved, not originally created as we

see them to-day. We have treated our question as an historical question, and have gone searching for clues in the past as an archæologist explores the past of buried cities, by digging, and collecting coins, implements, records, etc. and putting the facts together into a history. In the museums at Yale University are preserved upward of 30 steps or stages in the history of the horse-family, showing that it arose by evolution or gradual changes from a four or five-toed ancestor about the size of a fox and that it passed through many changes besides increase in size in the 2,000,000 years in which we can get facts as to its history. These facts, taken in connection with a multitude of others pointing in the same direction, give us the answer to the question: Were the immense number of living forms created just as we find them, or were they created by a process of evolution?

The series of shells and horses mentioned above are called evolutionary series. They were not known at the time of the publication of Darwin's great book on *The Origin of Species*.

The most interesting evidences of evolution bearing on all animal life are found in the various stages through which animals pass on their way from the egg to the fully formed animal. Every animal, above the Protozoa, begins its life as a single cell and passes through every gradation from that condition upward. As animals develop in this way, they become successively more and more complex, and many rudimentary organs arise and disappear. For example, in the young chick, developing within the hen's egg, there appear, after four days, gill-slits or openings into the throat, like the gills of lower fishes. These organs belong entirely to water-life, and are not of direct use to the chick. The heart and blood-vessels at this stage are also of the fish-like type, but all this disappears in a few days, long before the chicken is hatched. Similar gill-slits appear also very early in the development of the young rabbit and of all higher animals. The best way of explaining their presence — which certainly means something — is to say that they are inherited from remote parents. Animals in the course of their development repeat certain stages of their past histories. The presence of gill-clefts in the embryos of birds and rabbits probably means that both these animals sprang from ancestors that had gill-clefts, or water breathing animals. Such traces are like hieroglyphics and inscriptions on temples and columns — they are clues to ancient history and they weigh heavily on the side of evolution. If space permitted, the evidences in favor of evolution might be very much multiplied.

Having illustrated what the doctrine of evolution is, the main part of our task is done, for the questions regarding the different theories of evolution and the rise of evolutionary thought must be dealt with very briefly, and the reader directed to the best books for further information. The doctrine of evolution is regarded as established beyond controversy. The controversies about evolution to-day are not as to whether it was or was not the method of creation, but as to how evolution of different forms was brought about. Therefore we must distinguish between the facts of evolution and the factors. Although several theories have been advanced to account for evolution, only three command any particular amount of attention at the present time: those of Lamarck, Darwin and Weismann. Lamarck's theory was founded in the early part of the 19th century. Being greatly impressed with the differences produced in animal-life by surroundings — climate, temperature, moisture, elevation above the sealevel, etc., he came to believe that all variation in animals had been produced by different surroundings, and the effects of use and disuse of organs. The use of the muscles of the blacksmith's arm, for example, develops it greatly; the disuse of the wings of the wingless birds has led to the disappearance of their wings. The differences thus produced are inherited. While the explanation of Lamarck has two factors, that offered by Darwin has three. He showed that animals vary in a state of nature, that these variations are inherited and, thirdly, that nature selects the fittest to survive, through the failure and death of the weaker ones in the struggle for existence. The variations that prove of advantage to the individual would be the ones preserved and handed along by heredity. This theory was arrived at, independently, by A. R. Wallace, and should be known as the Darwin-Wallace theory of natural selection. But this is not evolution; it is an attempt to explain *how* evolution was brought about. Weismann's theory is difficult to state briefly and clearly. It is called the theory of continuity of the germ-plasm. He accepts Darwin's natural selection, and shows that the germ-plasm, or substance from which animals arise, is continuous from generation to generation. Heredity is explained in a simple way, viz., the offspring is like the parent, because some of the same stuff enters into all its cells. He concludes, further, that the germ-plasm must be impressed by surroundings before changes in the animal can be inherited. The theory of Weismann is losing ground while Mendel's ideas have exerted fully as much influence as Darwin's. Mendel (*q.v.*) discovered that a certain characteristic of one parent, for instance tallness in the common pea, tends to overcome in the offspring another

characteristic—e. g. shortness—when a tall and a short individual are mated, and that the number of tall and short descendants can be mathematically computed according to a definite law. This rule applies to all characteristics, though only a few of its phases have been worked out in the case of human beings, and the whole question is immensely complicated.

Let us now look briefly at the rise of the doctrine of evolution. Osborn has shown that there is a continuous train of thought along this line from the Greeks to Darwin, but modern evolution began at the close of the 18th century and did not fairly take hold of the minds of people till after 1859. Linnæus (1707-78), by defining species and giving them names that were adopted all over the world, directed the attention of naturalists to species, and thus made possible a consideration of the origin of species. He considered them fixed and unchanging. His contemporary, Buffon, gradually grew to the idea that the higher forms of life were derived by modifications from the lower ones. These views were warmly supported by Erasmus Darwin, the grandfather of Charles, and by the poet-naturalist Goethe. Lamarck, however, was the first fully to grasp the idea of evolution in its entirety. His book dealing with the subject (*Philosophie Zoologique*) was published in 1809, but his views were strongly opposed by Cuvier. They were shared by his friend Geoffroy St. Hilaire, and a noteworthy public debate took place at Paris in 1830 between St. Hilaire and Cuvier on the question of organic evolution. Cuvier won by weight of authority and greater brilliancy. An important step in preparing the way for Darwin was taken by Charles Lyell in his *Principles of Geology* (1830), in which he showed that, if we would know what occurred in the past, we must observe the agents that produce changes in the present and read the past in terms of the present. Herbert Spencer in 1852 published a remarkable article on evolution, that came near anticipating Darwin. Wallace and Darwin arrived at the same explanation independently, and in July, 1858, their views were published together. Next year Darwin published his *Origin of Species*. This had a compelling power, and at once attracted wide attention, partly because the time was ripe, but mainly because he had a better explanation to offer than any previous thinker. The general theory of evolution had a long conflict with religious and philosophical dogma over which it finally triumphed. Huxley in England and Haeckel in Germany were especially active in promoting the ideas of Darwin. Later, Mendel's laws of heredity have opened a vast new field of biological knowledge. The following books are recommended: Romanes, *Darwin and after Darwin*, Vol. I.; Wallace, *Darwinism;* Fiske, *Destiny of Man;* Osborn, *From the Greeks to Darwin;* Darwin, *Origin of Species*; Weismann, *The Germ-Plasm;* Romanes, *An Examination of Weismannism;* Batesman, *Mendel's Principles of Heredity.*

Ewell (*ū'ĕl*), **Richard Stoddert,** a Confederate general, was born at Georgetown, D. C. in 1817, served in Mexico and against the Apaches, and was actively engaged throughout the Civil War. In 1862 he distinguished himself under Jackson, losing a leg near Bull Run in August; and, having been promoted to lieutenant-general, he served gallantly at Winchester, Gettysburg and the Wilderness. At Sailor's Creek, however, he was captured, with his entire force, April 6, 1865. He died at Springfield, Tenn., Jan. 25, 1872.

GENERAL EWELL

Ewing (*ū'ing*), **Thomas,** an American statesman, was born in Virginia in 1789. He fitted himself for college by night-study while at work in the Kanawha salt-works. He graduated at Ohio University at Athens, O., receiving the first degree of A. B. ever given in that state. He was admitted to the bar in 1816, and was soon known as one of the first lawyers in Ohio. He was United States senator from 1831 to 1837, secretary of the treasury in 1841, and in 1849 he organized the newly-created department of the interior, returning afterward for a time to the senate. He was strongly opposed to slavery, voting against the fugitive-slave law and for the abolition of slavery in the District of Columbia. He introduced many improvements in the postal service. He died at Lancaster, O., on Oct. 26, 1871.

Excal'ibur, the sword of King Arthur, according to the legends, was given to the king by the Lady of the Lake, to whom it was to be restored at his death. Tennyson weaves a beautiful legend of how Sir Bedivere, being ordered by Arthur to cast the brand into the mere, twice hides the gleaming weapon before the reproaches of the king induce him to obey. A white hand caught the flying sword and drew it beneath the surface of the lake. See *The Passing of Arthur.*

Excursions, School. Out-door excursions with school-children for purposes of education have in recent years become a well-recognised mode of enlarging their ideas and range of experience. The main purposes of such excursions are to bring children in contact with the great outside world by direct experience and observation; and to give more reality to study;

make it less bookish and verbal; and make it more objective and concrete, more experimental.

All studies deserve to be based as far as possible upon direct experience. There, however, are certain studies which especially demand outdoor work and more or less extended excursions away from the school-house.

The chief classes of excursions may be stated thus:

1. Nature-study excursions. It is generally admitted that plants and flowers, birds and bees, butterflies, rocks and soils, field and country can best be seen and studied in their natural habitat. Books can not take the place of these outdoor conditions, and a close observation of these real objects in their relations to one another is the best kind of teaching.

2. In primary geography much of the work should be done out of doors, visiting the hills, valleys and streams of one's neighborhood, the shops and factories of one's native town, studying the commerce and shipping by wagons, railroads and by water, the construction of houses, the local political interests of the town and also the weather-conditions and changes of season. Children can not get these first experiences out of books, and the excursion is especially suitable to these topics in home geography.

3. Places of local historical interest are visited. Many neighborhoods have such spots, where the Indians lived, where the first settlers built, where the oldest buildings stand, where eminent men have lived or performed important deeds. Some towns have museums where old relics and mementoes of historical interest are preserved and may be seen by the children.

4. It is not unusual now to take children on a visit for a day or more to the state capital, the state university or some place of great scenic interest or to some large city, as Chicago or Cleveland, New York or San Francisco. The museums of fine arts in some of our cities are especially worthy of visitation by school-children, as the Metropolitan Museum in New York, the Art Institute in Chicago, the Carnegie Institute in Pittsburg, etc.

5. A visit to the city of Washington from those states near enough to allow it is of special interest for the purpose of seeing public buildings, monuments, etc.

Excursions have long been generally introduced into the schools of Germany. It is not unusual for a teacher in Germany to set off with a group of boys for a trip of two or three weeks through some interesting region, such as the Thuringian Forest, or the Harz Mountains, visiting famous scenic resorts, climbing mountains, seeing the places made famous by great men, cities and towns, churches and noted buildings, etc.

There are some serious difficulties to be considered in excursions with children. It is a great burden and responsibility to take charge of children upon such excursions. Most teachers prefer to keep children orderly in the school-house. It is expensive to transport children to any considerable distance in large cities by street-car or boat or by railroad. In visiting factories and shops certain dangers and interferences must be avoided.

In spite of these troubles and difficulties the advantages are so great that the tendency to extend the excursion is growing, and they are likely to be much more generally introduced in the future.

Many nature-study books suggest good excursions, as follows: *Field-Book of American Wild-Flowers* (Mathews); *Birds of Village and Field* (Merriam); *A Guide to Trees* (Lounsberry); *Life in Ponds and Streams* (Furneaux); *How to Read a Pebble* (Charles); *Outdoor Studies* (Needham); *Excursions and Lessons in Home-Geography* (McMurry); and *My Saturday with a Bird-Class* (Miller). C. A. McMurry.

Ex'eter, England, the capital of Devonshire, 171 miles from London, is "as good a specimen of an English county-town, at once prosperous in business and with a quiet air of aristocratic distinction, as can be found within the four seas." It is built on the summit and slopes of a flat ridge, rising 150 feet from the left bank of the Exe, and as a seat of commerce and industry has been left behind by many younger cities. Its woolen trade, once second only to that of Leeds, is a thing of the past, but it is yet the chief market of Honiton lace. It also has large nurseries and manufactures of gloves, agricultural implements, etc. A ship-canal extends five miles to the tideway. St. Peter's cathedral is a long, low edifice with massive towers. These towers are the original Norman ones (1112). The town has a picturesque guildhall (1464); while the Devon and Exeter hospital (1743), the lunatic asylum (1865) and the Albert Memorial Museum (1868) are the most noteworthy of modern buildings. It had a stormy time from 876, when it was captured by the Danes, down to 1688, when William of Orange entered it. The tragic burning of the new theater, Sept. 5, 1887, entailed a loss of 188 lives. See *Exeter*, by Freeman, in the Historic Towns Series. Population 48,660.

Exeter Hall is a large building situated on the Strand in London, England, completed in 1831. It will seat over 5,000 persons. It is rented chiefly for religious assemblies, and is in great request during the May meetings of religious societies. Many fine musical concerts have been given in it. In 1880 it was purchased for the Young Men's Christian Association for $100,000.

Explosives may be either mere mixtures, such as gunpowder, or chemical compounds, such as nitroglycerin. They may all be made to explode under sufficient heat; for example, dynamite or nitroglycerin at 180° C., blasting powder at 270°C. and rifle-powder at 270°C. The oldest of the explosives is gunpowder, which is a mixture of potassium nitrate, sulphur and charcoal, in some such proportion as 75 per cent., 10 per cent. and 15 per cent. respectively. The principle of explosives is to bring oxygen into very close contact with combustible substances. Thus even finely powdered wood-dust in the air may be an explosive. When the combustion is simultaneous, it is called detonation. The powerful explosive called guncotton, discovered in 1845, is made by treating cellulose with nitric acid. Guncotton is used in smokeless powder. Nitroglycerin, discovered in 1847, is made by treating glycerin with a mixture of nitric with sulphuric acid. Dynamite is made by combining nitroglycerin with an absorbent substance that prevents it from decomposing, as it would otherwise do. Explosives, chiefly for military use, are an important item of manufacture in the United States and the total value of these products increased from $10, 993,131 in 1890 to $40,139,661 in 1909.

Expositions. National and international exhibitions or expositions of manufactures, arts, commerce, agriculture and mining are a feature of the present and the recent century. The first of any importance was held at Paris in 1798, and for half a century these displays were held every three years. In this, as in other things, Paris set the fashion. Between 1820 and 1850 exhibitions were held at Vienna, Berlin, Brussels, St. Petersburg, Stockholm, Moscow, Lisbon, Madrid, Dublin, Manchester, Leeds, Birmingham, New York, Philadelphia and many other cities. The first really national exposition in England was held in 1851 at the Crystal Palace, London; and the first of great importance in the United States was held in New York in 1853. The idea was also adopted in the east, and a large exposition was held at Constantinople in 1863. These great industrial shows had now become quite common events, and we need only mention as instances in the next few years the magnificent Paris Exposition of 1867 and the one at Vienna in 1873. The Philadelphia Centennial Exposition of 1876 was held in commemoration of the hundredth anniversary of American independence. Other recent expositions in this country have been those at Louisville in 1882 and at New Orleans in 1884. The Paris Exposition of 1878, which surpassed all others before it, was overshadowed by the Universal Exhibition of Paris in 1889. The Eiffel Tower (which see), wonderful as it was, was rivaled by the Machinery Palace, which had a span of 377 feet, but was without pillars or like support.

The World's Columbian Exposition, in Chicago in 1893, far exceeded all its predecessors. The opening of this century was marked by two industrial exhibitions of some magnitude and attractiveness, one at Glasgow, Scotland, and the Pan-American Exposition at Buffalo, N. Y. The design of the latter was to illustrate the progress of the age in science, arts and industries. The exposition also had for its object to promote trade among all American countries and to present an object-lesson showing the industrial development of the continent. Part of its motive-power was obtained from the Falls of Niagara. The St. Louis Exposition of 1903 was held to commemorate the centenary of Jefferson's purchase of the Louisiana territory; the Portland, Oregon, Exposition of 1905 memorialized Lewis and Clark's conclusion of their exploration of the new acquisition; and the Jamestown, Virginia, Exposition celebrated the tercentenary of the founding of the first English colony in the United States. Seattle, Washington, held an Alaskan Exposition in 1909. The Panama-Pacific Exposition held in San Francisco in 1915 jointly celebrated the 400th anniversary of the discovery of the Pacific and the opening of the Panama Canal. In spite of the war raging in Europe at this time, this Fair was a splendid success and surpassed all previous efforts.

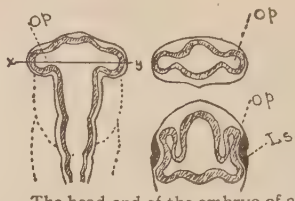
Express Companies. This is an American system organized for the speedy transmission of parcels or merchandise of any kind and their safe delivery in good condition. It began in the trip made from Boston to New York by William Frederick Harnden (1813–45), the first "express-package carrier," on March 4, 1839. The plan recommending itself to business men, competing companies sprang up rapidly, and express lines were established in all directions. Adams & Company's California express was started in 1849; Wells, Fargo & Company's in 1852; the American-European Company in 1855. As railroads extended, the early "pony express" disappeared, and individual companies made contracts with the railroad companies, their business over these routes being held to be entitled to the protection of the courts against any efforts to dispossess them. Many of the rival companies united, and now are joint-stock institutions, employing capital amounting to over $50,000,000. A feature of the system is the "collect on delivery" business—goods to strangers being marked C. O. D., with the amount to be collected, the express company making the collecting and forwarding "returns" to the shipper. Money-orders also are issued, payable at any of the numerous offices throughout the United States. They are received at banks from depositors and

are often preferred as cheaper and safer than checks or postal orders for small remittances by mail. See A. L. Stimson's *History of the Express Business.*

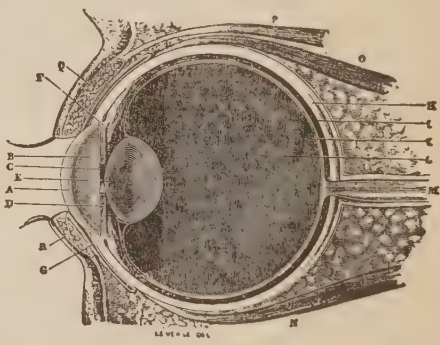
Extradition is the surrender of a prisoner accused of a crime by the government in whose dominions he has taken refuge to the government of which he is a subject, so that he may be punished or dealt with according to its laws for an offense committed within its jurisdiction. The crimes for which extradition may be demanded comprise murder, manslaughter, counterfeiting and forgery, embezzlement and larceny, obtaining money or goods on false pretenses, etc. Between this country and Great Britain the offenses number nearly 30 that are extraditable, though political offenses are excluded, as they usually are in all international treaties. Since the assassination of President Garfield provision has been made in the treaties of this country with foreign powers that attempts against the head of the state, in the way of assassination, murder or poisoning, shall not be deemed political offenses, and so they are extraditable. The rendition, in this country, of criminals or fugitives from justice from one state to another is provided for by the constitution; the state making demand for the return of the criminal paying the costs connected with the arrest and surrender of the person extradited.

Eyck (*īk*), **Hubert** and **Jan van,** two illustrious painters of the early Flemish school. They probably were born at Alden Eyck or Masseyck on the Maas, but the date of their birth is uncertain; Hubert is supposed to have been born about 1370 and Jan about 1389. The distinction of being the inventors of oilpainting is claimed for them, though evidence exists that it was practiced previously. But the Van Eycks were the first who brought into notice and perfected the mode of mixing colors with oil. For transparent and brilliant coloring and minute finish their works have never been surpassed. Jan seems to have been instructed in art by his elder brother and to have worked with him as court-painter to Philip of Charolais till 1422, when he entered the service of John of Bavaria, count of Holland, at The Hague; and in 1425 he was appointed painter to Philip the Good, Duke of Burgundy, practicing his art chiefly at Bruges. Hubert continued to reside in Ghent, and at the time of his death, Sept. 18, 1426, was engaged upon an important altarpiece, which was completed by Jan. The masterpieces of the brothers are mostly met with in Ghent, Bruges, Antwerp, Berlin, Munich and Paris. Three pictures of Jan's are in the National Gallery, London, dated 1432, '33 and '34. In the Louvre, Paris, is his exquisitely finished little picture of *Chancellor Rollin kneeling before the Virgin.* Jan died at Bruges on July 9, 1440. See *Early Flemish Painters* by Crowe and Cavalcaselle.

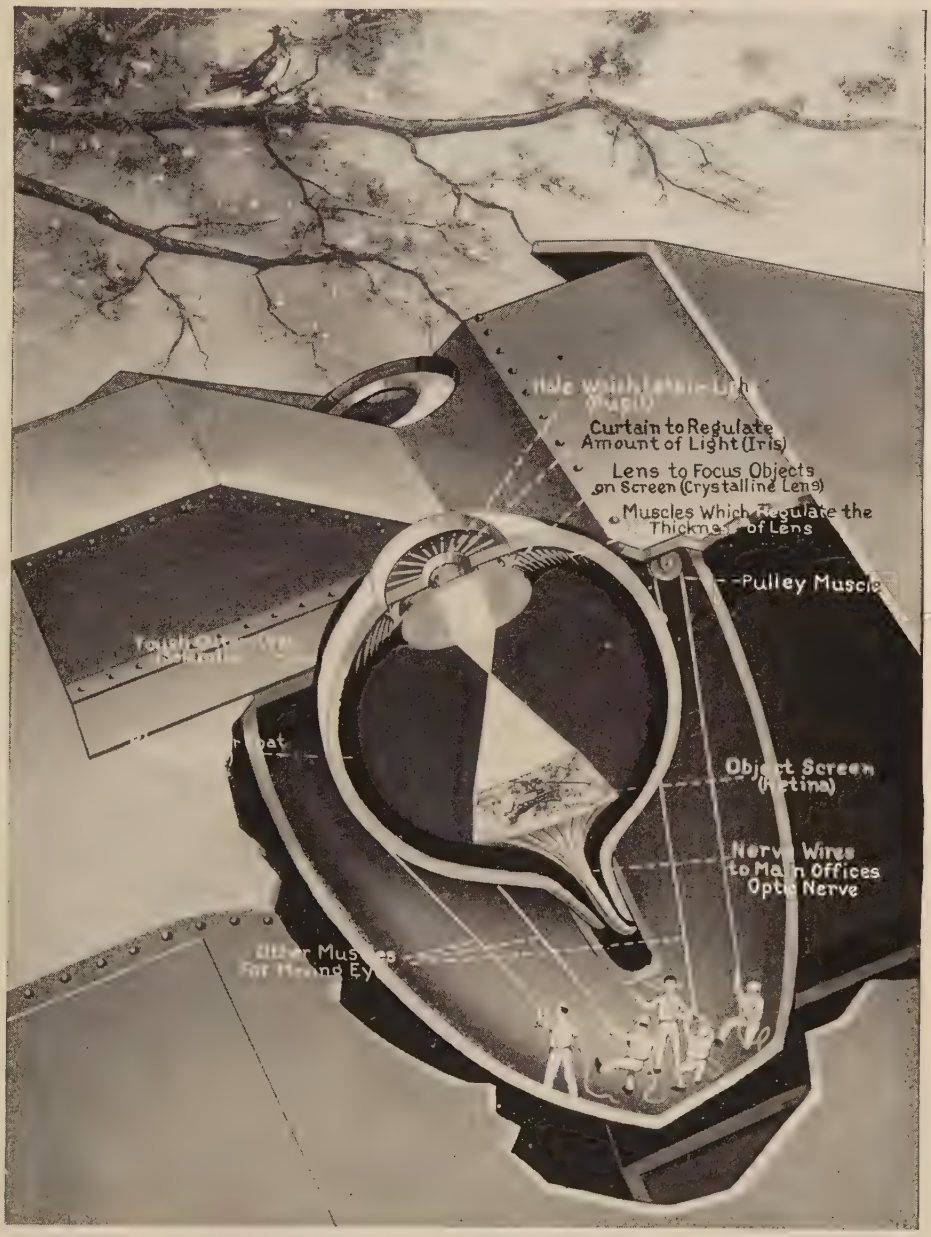
Eye, the organ of sight. In some single-celled animals there is a colored spot sensitive to light, and from this simple condition to the complicated eye there are many gradations. In worms, insects and mollusks the eye develops from the surface-layer of cells by their becoming thickened and sometimes folded in. This is called a skin-eye. Nerve fibers grow from surface cells and pass to the brain. In the vertebrated animals the eye comes from a portion of the brain-wall, and has been called a brain-eye. But if the matter be looked at in an unprejudiced way, we shall see that the brain-wall at first was on the outside and, therefore, a portion of the surface layer of cells. The brain is formed by the rolling together of the outer layer of cells in such a way as to form a hollow tube, the walls of which become bulged out in several places, forming a row of enlargements or cavities. The eyes first appear as pockets or bulges (*op* in the illustration) from the front cavity of the brain; in this condition they are called optic vesicles. An optic vesicle is converted into an optic cup by changes best explained by reference to the illustration. The lens (*Ls*) is set free from the outer layer of cells and the wall of the original vesicle (*op*) becomes folded in to form a sort of cup, connected to the brain by a stalk. This is the beginning of the eyeball. The eyeball when fully formed consists of three coats: Sclerotic, the tough outer coat; choroid, the dark middle coat; and retina, the delicate inner coat about $\frac{1}{50}$ in. thick. The main cavity of the eyeball



The head-end of the embryo of a bird showing the formation of the optic vesicles (*op*) and the lens (*Ls*). The figs. on the right are sections through the head.


THE EYE

HOW THE EYE TAKES PICTURES



Compare the position of the bird with the picture of him in the camera. The rays from the bird are crossed in passing through the lens and so the image is inverted. The size of the hole the pupil, through which the light passes, is regulated by a curtain, the iris, much as the photographer regulates the light entering his camera. Another particularly interesting thing about the eye is that muscle which is actually operated on the pulley principle, like a well rope with its wheel, although the eye arrangement is really not quite so much like a wheel as the illustration shows. And, of course, there are no little people in the eye. These busy folks simply represent the working power of the muscles. Notice that one of the workers is directing the others. This means that the eye muscles only move as they receive instructions from headquarters.

is filled with vitreous humor (see diagram); in front of that is the crystalline lens; and, still further forward, is a cavity containing aqueous humor. All of these are transparent. The sclerotic coat in front is transparent and bulges out into the cornea. The choroid coat bends down in front, as a sort of curtain, and forms the colored iris of the eye; this is perforated in front by a circular opening—the pupil of the eye. The iris has circular and also radiating muscle fibres, the contractions of which cause the pupil to vary in size according to the intensity of the light. The retina is a delicate, whitish coat of nervous material. It is very complex in structure, being composed of several sets of nervous structures arranged in layers. The outer ones are rods and cones, and the inner ones are large nerve cells. The optic nerve is made of fibers that spring from the retina and pass into the brain; it used to be supposed that the fiber of the optic nerve grew outward from the brain and spread out into the retina; it is now known that they begin their growth from nerve-cells in the retina and grow inward to the brain. The eyeball is a sort of camera with transparent lenses in front of the retina to focus light upon it. It can readily be shown that any lens, thicker in the center, will focus light on a screen in such a manner as to produce an image. If, for example, one stands by a window with a reading-glass and places a paper behind the glass at the proper distance, there will be an inverted picture of the landscape thrown on the paper by the lens. This is practically what occurs in the eye. The crystalline lens and other transparent parts in front of the retina focus light upon it and produce an inverted image; but it is the brain that does the seeing,—the eye is merely a receiving apparatus. The rays of light that strike the retina excite it to activity, and this is transmitted to the brain and brings about changes there which give rise to sight. Not all parts of the retina are equally sensitive to light. The yellow spot is the most sensitive; this lies in a line drawn directly through the center of the lens. It is a rounded, shallow depression, in which the retina is much thinner and is composed mostly of rods and cones. The remainder of the retina is sensitive to light, except the blind spot, which is the place where the fibers are gathered into the optic nerve. The rods and cones are the parts affected by the light—the fibers not at all. Therefore, in the optic nerve, which is composed entirely of these fibers, there is no activity set up by light; they are merely conductors of the effect produced on the rods and cones by the light. The optic nerve is not connected with the eyeball symmetrically, but on the part nearer the nose, so that the blind spot is not in the center of the field of vision. The eyeball is moved by muscles—four straight ones and two oblique ones—so arranged that the eyeball may be turned up or down, to the right or left, and also slightly rotated. Certain defects in the eye are corrected by wearing glasses. When the lens is too rounding or the eyeball too long, the person is short-sighted; rays of light come to a focus before they reach the retina, and vision is hazy. This is corrected by concave glasses that tend to spread the rays of light. When the eyeball is too short, or the lens too flat, the person is long-sighted, and the rays of light come to a focus behind the retina. This is corrected by convex glasses that bring the rays of light to a focus earlier. The crystalline lens is capable of being changed to a limited degree. It is an elastic body, and is inclosed in a perfectly transparent membrane. Under ordinary conditions it is pressed upon and rendered slightly flatter than it would otherwise be; when the tension or pressure on it is reduced by the contraction of certain muscles within the eyeball, it bulges out more, and when the muscles return to their state of extension it is flattened again. The eye is accommodated in this way to clear vision for objects at different distances.

Eylau (*ī'lou*), 23 miles by rail south of Königsberg, has 3,546 inhabitants. Napoleon here encountered the allies—Russians and Prussians—under Bennigsen, Feb. 8, 1807. Darkness came on while the contest was still undecided; but, as Napoleon had a considerable force of fresh troops close at hand, the allies retired during the night upon Königsberg. Their loss was estimated at about 20,000; that of the French is set down at 10,000, but must have been much greater. The place is called Preussisch-Eylau, to distinguish it from Deutsch-Eylau, a town of 4,574 inhabitants, 89 miles northeast of Bromberg.

Eze'kiel (meaning God shall strengthen or Strength of God), one of the Hebrew prophets, was carried captive, when still a young man, along with Jehoiachin, king of Judah, to Mesopotamia by order of Nebuchadrezzar about 599 B.C. He was a member of the Jewish community which settled on the banks of the River Chebar, and first appeared as a prophet about 594, after the remarkable vision described in the opening chapters of *Ezekiel*. His career as a prophet extended over a period of 22 years. The date of his death is not recorded. *Ezekiel* was placed by the Jews among the "treasures," not to be read before the age of 30.

Ez'ra (Help), a Jewish scribe, lived about 450 B. C., and was regarded by the Jews of Christ's time as the second founder, with Nehemiah, of the Judean state. Judaism, as a religion, in distinction from the Hebrew religion before the captivity, dates from his day.

F

F (*ĕf*), the sixth letter, is a consonant. It is called a labio-dental surd, because it is made with the lips or, more commonly, with the lower lip against the upper teeth, and does not sound. It requires considerable breath to pronounce it, and gives a simple breath-sound, as in *fame*. The Spaniards and Greeks had great difficulty in pronouncing it. Its value comes from the Latin.

Fa'bius Max'imus, a member of one of the most illustrious patrician families of Rome. He was five times consul and twice censor, and was elected dictator immediately after the defeat of the Romans at Trasimenus. The tactics he observed in the second Punic War gave rise to what is now known as the Fabian policy in warfare. He avoided a direct engagement and harassed the enemy by guerilla warfare; he annoyed them by marches and counter-marches and cut off their stragglers and foragers; and during all this time his delay allowed Rome to assemble her forces in greater strength. He recovered Tarentum, one of Hannibal's strongholds. He died 203 B. C.

Factory and Factory-Legislation. It is not easy to set a date for the origin of factories. In England factories for wool were established in the reign of Edward III. But the nineteenth century was the great period of the rise of factories. This rise was the result of many new mechanical inventions, chief among which were those of Hargreave, Arkwright, Cartwright and Crompton. The factory-system of industry greatly increased the amount of production per man, but in bringing together great numbers of men, women and children it paved the way for the replacement of the old personal interest between master and workman by a mere cash-bond. Overwork and sweating became common practices. In England and America the first laws about factories dealt with the abuse of child and pauper-labor and with the lack of sanitary care within the factories, which became a fertile source of disease. The factory-system came later in America than in England. The English factories jealously guarded the secrets of their machinery. But in 1790 a factory for water-frame spinning was built in Rhode Island; and in 1803 the first cotton mill in America was built in Massachusetts. The growth of factories in America has continued with extraordinary rapidity.

The first modern factory-legislation in England was the law of Sir Robert Peel in 1802, dealing with the labor of children and paupers. A great number of acts followed, dealing with these and other problems. (See CHILD-LABOR ACTS.) In the United States, Massachusetts took the lead in labor-legislation; and the laws of the other states tend to be based on this code. But Australia and New Zealand have gone far beyond either England or America in limiting the hours of labor, the age of employees, the lowness of the wage that may be offered and the strife that is apt to occur from time to time between employers and employed, leading to wasteful strikes. But there are laws in the United States regulating the labor of women and children, sanitary matters, the soundness and safety of machinery, payment of wages, hours of labor (limited in Massachusetts to 58 hours a week for young people), hours of meals, licenses, etc.

Faed (*fād*), **Thomas,** a Scottish painter of renown, was born at Burley Mill, in Kirkcudbrightshire, Scotland, on June 8, 1826. He was made an associate of the Royal Scottish Academy in 1849, an associate of the Royal Academy in 1861, an Academician in 1864, and in 1875 was elected an honorary member of the Vienna Royal Academy. Among his celebrated pictures are *The Mitherless Bairn*, *The Last of the Clan* and *Scott and His Literary Friends at Abbotsford.*

Fahrenheit (*fä'ren-hīt*), **Gabriel Daniel,** the improver of the thermometer and barometer, was born at Dantzic, Prussia, on May 14, 1686. Originally intended for business, he abandoned trade at an early age and took up the study of natural philosophy. About 1714 he conceived the idea of using quicksilver instead of spirits of wine in the making of thermometers, thereby increasing their accuracy. Fahrenheit fixed his freezing point at 32°, to avoid errors in measuring the temperature. He was elected a fellow of the Royal Society, of London in 1724, and died on Sept. 16, 1736. For all practical purposes Fahrenheit's thermometer is the one in general use in the United States.

Fairbairn (*fâr'-bârn*), **Andrew Martin,** a notable Scottish theologian and principal of Mansfield College, Oxford, was born near Edinburgh, Scotland, on Nov. 4, 1838, and educated at the Universities of Edinburgh and Berlin and at the

Evangelical Union Theological College, Glasgow. For a time he held charges at Bathgate and Aberdeen, and from 1877 to 1886 was principal of Airedale College. In the latter year he was elected principal, on its foundation, of Mansfield College, Oxford, where his labors as a metaphysician and theologian have made him famous. He resigned in 1908. His many books, which are erudite and scholarly, have added greatly to his repute as a divine. These embrace *Studies in the Philosophy of Religion and History; The City of God; Christ in Modern Theology;* and *Religion in History and in Modern Life*

Fairbairn, Sir William, a Scottish engineer born at Kelso, Scotland, on Feb. 19, 1789. He was the first to use iron instead of wood in the shafting of cotton-mills, and was among the earliest of iron shipbuilders. Fairbairn built the tubular bridge across Mena Strait, after a plan of Robert Stephenson's. He improved upon this in the construction of the Britannia and Conway bridges, and, patenting his design, erected more than a thousand bridges upon this principle. In 1869 he was made a British baronet and a chevalier of the French Legion of Honor. He published many works and papers on iron bridges, boilers, mills. Fairbairn died at Moor Park, Surrey, England, on Aug. 18, 1874. See Smiles' *Lives of the Engineers.*

Fairbanks, Charles Warren, American statesman, born in 1852, near Unionville Centre, Ohio. His father came to Ohio from Vermont, in 1836. Mr. Fairbanks graduated from Ohio Wesleyan University, in 1872. He then studied law, and was admitted to the bar in 1874, after which he entered upon a successful legal practice in Indianapolis. In 1893 he received the support of his party for U. S. senator, but was defeated by David Turpie, the Democratic candidate. In 1893 he was delegate-at-large to the Republican national convention, and in 1897 became U. S. senator. He was appointed member of the Joint High-Commission to settle the dispute over the seal fisheries of Alaska. He was elected vice-president of the United States in 1904. He died June 4, 1918.

Fairbanks, Erastus, 1792-1864, born in Brimfield, Mass., founder, with his brother, Thaddeus, of E. & T. Fairbanks & Co., manufacturers of stoves, scales and plows. The Fairbanks family showed marked mechanical ability. The Fairbanks scale was invented by Thaddeus and perfected by later members of the family. Erastus served in the Vermont legislature and was twice governor of that state.

Fairfax (*fâr'făks*), **Thomas, Lord,** generally known as Sir Thomas Fairfax, an English general, was born at Denton, in Yorkshire, England, on Jan. 17, 1612. He distinguished himself at the battle of Marston Moor in 1644, and in 1645 was appointed to the command of the parliamentary forces. In 1650 he refused to march against the Scots, and the command was given to Cromwell. He retired into private life, and in 1660 was appointed head of the commission sent to The Hague to arrange for the return to England of Charles II. He died at Nunappleton, Yorkshire, on Nov. 12, 1671. See his *Correspondence.*

Fairmount Park. See PHILADELPHIA.

Fair Oaks is a small place in Henrico County, Virginia, the scene of a battle fought between the Union forces under General McClellan and the Confederate army under General Johnston, on May 31 and June 1, 1862. At the end of two days' fighting the Confederates retreated, their loss being estimated at 6,500. The Union loss was 790 killed and 3,627 wounded.

Fair'y or **Elf,** an imaginary being, generally thought to be of human form but very diminutive. A belief in fairies has been among the superstitions of most European nations. Other names for them are elves, brownies, dwarfs, pixies, mermaids, sirens, banshees, kelpies and gnomes; while Puck, Mab, Oberon and Titania are well-known names of individuals among them. The belief in their wonderful powers varies in different countries, but in all they have a great deal to do with human beings and their affairs. In England the good fairies care for the home, sweeping the house, preserving the butter, while the evil ones lure people into dangerous places. The pixies in Ireland are thought to be the souls of children who have died unbaptized. The banshee is an Irish fairy or elf, watching over a special family, as the brownies do in Scotland, many a Scottish family placing a dish of milk in a convenient place for the brownie, as regularly as for the cat or the dog. The kelpie, mermaid and siren are all water-fairies; the mermaids and sirens, half-woman, half-fish, with their beauty and their song lure unsuspecting travelers to their death. During the day fairies are invisible to man; they have their homes in the clefts of rocks, in caves and in forests. It is dangerous to come upon them unawares when in their night revels, and ill-luck follows one who offends them. The literature of all countries abounds in fairy tales. *Midsummer Night's Dream, Walpurgis Night,* Hans Andersen's Danish *Stories* and the Grimm brothers' popular German ones are examples well-known. See Keightley's *Fairy Mythology.*

Faith'full, Emily, was born at Headley Rectory, Surrey, England in 1835, and devoted her life to the improvement of the condition of working-women. In 1860 she founded a printing-house in London, where women only were employed as compositors. In 1863 she founded the *Victoria Magazine,* for the purpose of setting forth the claims of women to remunerative employment. Queen Victoria recognized Miss Faithfull's work by appointing her her publisher, and

she was awarded a pension of $250. She died at Manchester, England, on May 31, 1895.

Falcon (*fạ'k'n*), the name given to a number of diurnal birds of prey closely related to the hawks, properly applied to those belonging to the genus *Falco*. Birds of great courage and power of flight, with a hooked bill bearing a notch on the upper part and sharp claws adapted for grasping, falcons live in nearly all countries of the world, and there are many varieties. The peregrine or duck-hawk is the type of the family. It occurs both in Europe and America. The body is about eighteen inches long and the spread of wings about three and one half feet. It is dark bluish-ash above, with cross-bands of brownish black, creamy white below, with spots and bars of black. The throat is white, and there is a black spot on the cheeks under the eye. The eyes are brown. The birds rise in spirals above their prey and strike them from above, the shock of the blow and the sharp talons usually killing the prey at once. Besides water-fowl, they attack pigeons, snipe and other birds. They nest usually on rocky ledges. The gerfalcon is the largest and finest of the falcons. It is found in the northern parts of Europe and America, as also in Iceland and Greenland. The American form resembles the peregrine in color, but the Greenland form has white plumage with dark bars. Both the peregrine and the gerfalcon fly with astonishing rapidity; it has been estimated that they fly at times one hundred and fifty miles an hour. The pigeon-hawk is found throughout the United States. Although smaller than the duck-hawk, it is bold and fearless and kills birds larger than itself. It is like the European merlin. The common sparrow-hawk of the United States belongs also to the group of falcons. It corresponds to the very common British kestrel. It will nest in deserted woodpecker-holes or in martin-boxes. It feeds mainly on field-mice, insects and, occasionally, a small bird. The falcons are interesting from the circumstance that they were long used in the chase of smaller game. Long before the Christian era these birds were employed in this way, and falconry was a common field-sport for the nobles in Europe for many centuries. It was introduced into England about the ninth century. The birds were trained for taking a particular kind of game, including all kinds of birds,—even those as large as herons,—hares, rabbits, etc. They were carried out perched on the arm or glove of the hunter, frequently with a small leathern hood over the eyes, which was removed just before releasing the bird. Two kinds of falcons were recognized: noble hawks, with long wings that fly high above their prey and stoop to strike it from above, and ignoble hawks with short wings, that fly low and chase after their prey. The noble hawks, like the peregrine and gerfalcon, have dark brown eyes, the ignoble ones light yellow eyes. Falconry is still practiced in eastern countries and, though rarely, on some large estates in England.

PEREGRINE FALCON

GERFALCON

Falconer (*fạ'k'n-ẽr*), **Dr. R. A.**, president of the University of Toronto, was born in Nova Scotia. He was selected for this position out of eighty men under consideration by the governors. He was educated at Queens Royal College, Trinidad. While studying at Trinidad, he passed the Cambridge local examination with firstclass honors. He also passed the London matriculation, winning the Gilchrist scholarship. Later he took his M. A. with honors at Edinburgh. He studied for some time in Germany. Returning to Nova Scotia in 1892, he was appointed lecturer in exegetics in the Presbyterian College, Halifax, becoming professor in 1895, and later was appointed principal of the college. His work there was most successful. As an indication of his breadth of view it may be said that he was given the degree of LL. D. by St. Francis Xavier's College in 1905 In his new and wider field of work every indication points to a successful career, perhaps the premier educational position in Canada.

DR. R. A. FALCONER

Falkland Islands (*fak'land*), a cluster of islands in the south Atlantic, some 250 miles east of Patagonia. The group consists of East and West Falkland, with an area of 6,500 square miles, and about 100 small islands. Some of the islands are filled with myriads of penguins, and the governor has been called the king of the Penguins. The population in 1911 was 2,272. The climate is healthful, and resembles the Orkneys, off Scotland. There are no trees on the islands, neither is coal found there, but peat is plentiful. The chief industry is sheep-raising. The islands were first sighted by Davis in 1592 and received their present name in 1689 from Captain Strong in honor of Lord Falkland, his friend. The chief town is Port Stanley. Since 1833 the islands have belonged to Great Britain.

Fall River, a city of Massachusetts, 49 miles south of Boston, noted as a great cotton-manufacturing center. It contains nearly 42 cotton mills, and more cotton goods are made here than at any other point in America. A very important industry is the dyeing and finishing of textiles, and others are foundry and machine-shop products, etc. It has fine public schools, with a teaching force of 300 and an attendance of 17,100 pupils. The city has a free public library of about 40,000 volumes. Population, 119,295, an increase of over 60 per cent. in 20 years.

Fallieres, Clement Armand, French politician and legislator, born at Mezin in the Department of Lat-et-Garonne in 1841. He now is president of France, having been elected to that office on January 17th, 1906. At 30 he was elected mayor of Nérac, and in 1876 he became a representative in the national chamber of deputies. He was a member of many of the cabinets from 1880 to 1892. He was elected to the senate in 1890 and subsequently acted as president of that body.

Falls of Montmorenci. See QUEBEC.

Faneuil Hall. See BOSTON.

Faraday (*făr'ȧ-dȧ*), **Michael,** the leading physicist of the English-speaking races during the first half of the 19th century, was born in the suburbs of London on Sept. 22, 1791, and died at Hampton Court on Aug. 25, 1867. At 14 he was apprenticed to a bookbinder, and there managed to educate himself largely from the books which were brought in for binding. Having attracted the attention of Sir Humphry Davy by a set of notes which he had prepared on some lectures heard at the Royal Institution, he received an appointment as assistant in chemistry at the Royal Institution. This was the beginning of that remarkable scientific career which led Sir Humphry Davy in his later years to reply to the query: "What do you consider the greatest scientific discovery you have ever made?" "Michael Faraday." Among Faraday's principal achievements may be mentioned: The discovery of the laws of electromagnetic induction. (See ELECTRICITY); of those of electrostatic induction; and of those of electrolysis. (See ELECTROLYSIS); of the properties of paramagnetic and diamagnetic bodies; and of a connection between light and electricity, viz., the electromagnetic rotation of polarized light.

Every student should read his *Experimental Researches in Electricity.* His papers on electrolysis have been edited and reprinted by Professor Goodwin in Harper's *Scientific Memoirs.*

Faraday was a man of the highest character and beloved by every one who knew him. Many learned societies at home and abroad sought to honor themselves by honoring him. There is a true sense in which Faraday's work was completed by Maxwell, who clothed Faraday's ideas in mathematics, and by Hertz who showed by experiment (1888) that Maxwell's mathematical inferences were correct.

Fargo, a city of North Dakota, the county-seat of Cass County, opposite Moorehead, Minn., situated on the Red River, 254 miles west of Duluth. It is an important commercial and railroad center, having six banks and numerous other public institutions. The region about is a great wheat district, equipped with the latest and most approved farm machinery, and makes Fargo one of the great distributing centers of the U. S. for farm-equipment, as well as a manufacturing point of many articles used in farmwork. Besides a United States land-office, Fargo has the North Dakota Agricultural College, Experiment Station, a Congregational college, a Roman Catholic academy and a number of fine churches and public schools, a handsomely equipped High School, offering manual training as well as several courses. It was a small village in 1874, but now is the largest city in the state. Population 14,331.

Farinelli (*fȧ'rê-nĕl'ê*), **Carlo,** was one of the best singers of the 18th century. He was born at Naples or at Andria, on Jan. 24, 1705. He sang before nearly all of the European monarchs of his time, and through his voice gained wonderful power over Philip V of Spain, which gave him almost the place of a prime-minister. He died at Bologna on July 15, 1782.

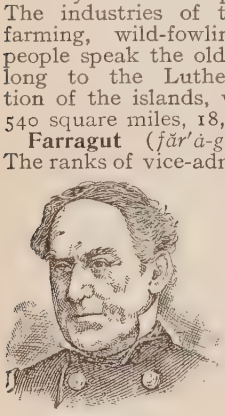
Farjeon (*fär'jŭn*), **B. L.,** English novelist, was born at London, of Jewish parentage, in 1833. He spent his early journalistic and literary life in New Zealand; he married in 1877 the daughter of Joseph Jefferson, the American comedian; and for a time he employed himself as a playwright. His first story to attract attention was *Grif,* which appeared in 1870, and dealt with Australian life. This was followed by a

number of tales of strong sensational interest, as *Blade-o'-Grass, Bread and Cheese and Kisses* and *The Betrayal of John Fordham.* He died on Aug. 1st, 1903.

Farley, John M., archbishop and Roman Catholic metropolitan of New York, was born in 1842 at Newton Hamilton, Ireland, and came as a youth to America. He studied for the priesthood at Fordham and at Troy, N. Y. He was ordained in 1870 at Rome. Archbishop Farley held many special and responsible positions, and for some time was rector of St. Gabriel's Church, New York. In 1902 his name was unanimously suggested by the diocesan rectors, provincial bishops and American archbishops for the vacant see of New York; and he received his pallium in 1903 from Pius X. Archbishop Farley was a force in the conversion of thousands of immigrants into good citizens. He died in 1918.

Färoe (*fä'rō*) **Islands,** a Danish group of 22 islands, 17 of which are inhabited, lying between the Shetlands and Iceland. Toward the sea they are rugged cliffs, from 1,000 to 2,300 feet high, while in the inland portions they rise into flat-topped mountains some 3,000 feet in height. The largest island is Strömöe, on which is situated the capital, Thorshavn, with a population of 984 people. There are no trees found on the islands, timber being imported from Norway. Coal and peat, however, abound. The industries of the people are sheep-farming, wild-fowling and fishing. The people speak the old Norse dialect and belong to the Lutheran Church. Population of the islands, which have an area of 540 square miles, 18,000.

Farragut (*făr'ȧ-gŭt*), **David Glasgow.** The ranks of vice-admiral, rear-admiral and admiral of the United States Navy were created successively to reward the services and acknowledge the genius of this greatest of American naval heroes. The operations which resulted in the capture of New Orleans and Mobile are comparable only to those of Nelson at Copenhagen, the Nile and Trafalgar. The difficulties to be overcome were infinitely greater, and the operations extended over a longer period of time. The exploits of Dewey at Manila and of Togo in the Japan Sea were accomplished under such different conditions, due to modern inventions, as to place them in a class apart from sea-fighters of even a generation ago.



DAVID G. FARRAGUT

Farragut was born on July 5, 1801, in a pioneer cabin near Knoxville, Tennessee, of a Spanish-descended father and a Scotch mother. Owing to his father's friendship with Commodore Porter the boy was shipped on the frigate *Essex* before his tenth birthday. Our naval academy was not established until 1845, so cadets were educated and trained at sea. When only 12, Midshipman Farragut took a prize-ship (War of 1812) into Santiago, Chile, and acted as powder-boy in the battle of Valparaiso. Forty-five years of routine duty followed, on cruisers, on training ships, testing ordnance in the department at Washington and in charge of the work of establishing the naval station at Mare Island, San Francisco. When the Cival War began he was in his 60th year. Of southern birth, with a Virginia wife and home, he decided that his fealty belonged to the nation. In February, 1862, with the rank of admiral he was given a fleet of 48 vessels, of 200 guns, the largest ever fitted out by the United States up to that time, and ordered to take New Orleans and clear the Mississippi of Confederate forts and gunboats.

Not one of his ships was an ironclad; some were propelled by steam, others were sailers; all had been built for sea-service. With these he had to operate in a narrow, shifting river-channel, pass two forts, break through chains connecting anchored barges, turn aside blazing fire-boats, risk torpedoes, sink the fleet of the enemy above all these obstructions and reduce the city. He accomplished the task in three months' time with a loss of only 37 men and one vessel. For 16 months thereafter he was so continuously under fire as he moved up the river, and so invariably the victor, that he won the nickname of Old Salamander. In January, 1864, he captured Mobile in one of the most brilliant engagements of naval history. When the dead were laid out on the deck of the flagship, he wept like a child.

Farragut was such a master of detail that he could have taken the place and done the work of any man in his fleet. Honest, upright, religious, of tender sympathies, he inspired respect, enthusiasm and personal affection. The war wrecked his health, so that he died in Portsmouth, N. H., on August 14, 1870. Congress purchased Virginia Ream's statue of him for Farragut Square, Washington, and New York City has one by Augustus St. Gaudens. You will remember this couplet from a tribute to him by Holmes:

The Víking of the River Fight,
The Conqueror of the Bay.

See *Life* by Loyall Farragut, his son.

Farrar (*fär'ȧr*), **Frederick William,** a clergyman of the Church of England and dean of Canterbury, was born at Bombay, India, on August 7, 1831. He received his early education at King William's College, near Castleton, Isle of Man, and afterward attended King's College, London, and Trinity College, Cambridge, from which he graduated in 1854. Soon after his

ordination he became known for the brilliancy of his preaching, and in so high esteem were his sermons held that in 1873 he was appointed a queen's chaplain. He has often been university preacher both at Oxford and Cambridge, and the latter honored him with the doctorate of divinity in 1874. In 1876 he was appointed canon of Westminster Abbey, and in 1883 was made archdeacon In 1895 he was made dean of Canterbury. As a writer, Dean Farrar was pre-eminent in his line. His early works were stories of school and college life. His later efforts were in theology, his *Life of Christ*, which passed through 12 editions in 12 months, making him known throughout the world. He contributed largely to magazines and periodicals, and published volumes of sermons. Among his other works are *Life of St. Paul; Early Days of Christianity; Witness of History to Christ; Seekers After God;* and *Eternal Hope*. He died on March 22, 1903.

DEAN FARRAR

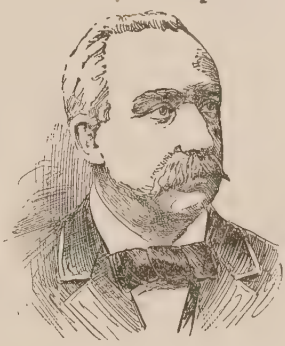
Fasho'da, a town of Sudan, upon the White Nile, was the center of a serious dispute in 1898 between England and France. It had been occupied by a French expedition under Captain Marchand; but the British, fresh from their victory at Omdurman, claimed the town for Egypt. In the end Fashoda was evacuated by the French, who in return received an extension of their possessions in Central Sudan.

Fast, doing without food for any cause, but usually as a religious ceremony. Its origin is doubtful, but by degrees it became a religious observance, and is recognized by the Roman Catholic church as a church-law of discipline. The Mosaic law set aside one day yearly for the purpose of fasting, the tenth day of the seventh month, called Yom Kippur or Day of Atonement. In course of time five more fast-days were added in memory of days of humiliation and national misfortune. Many new ones have since been added; but among the orthodox Jews few of them observe any but those of Yom Kippur and the five mentioned. Fasting in the Greek church is observed with great austerity. The principal fasts are Wednesday and Friday; Easter, 48 days; Christmas, 39 days; that in honor of the Virgin 14 days; and that of the Apostles extends from the first Monday after Trinity to the 29th of June. The Church of England and the Episcopal church of the United States recognize fasting as praiseworthy, but do not command it. See Robert Nelson's *Festivals and Fasts of the Church.*

Fates, a term in Greek mythology used to represent the three daughters of Night: Clotho, the spinner of the thread of life; Lachesis, who determines the length of the thread or the lot of life; and Atropos, or the inevitable, who cuts the thread. They were represented sometimes as young women, sometimes as matrons. They had places consecrated to them at Sparta, Corinth, Thebes and Olympia.

Faults (in geology). The earth's crust is affected by numerous fissures or joints, which extend from the surface down to unknown depths. Along some of these fissures slipping sometimes takes place, the strata on the one side rising or sinking relative to those on the other. Displacements of this sort are faults. Faulting probably is a chief cause of earthquakes. (See any text-book on geology.)

Faure (*fōr*), **François Felix,** French statesman and president (1895-99) of the republic, was born at Paris on Jan. 30, 1841, and died there on Feb. 16, 1899. He was quite a self-made man, originally a currier; but he became a merchant and shipowner at Havre and an authority on shipping, commercial and colonial questions. He took part in the Franco-Prussian War, and was decorated for services in Paris in suppressing the rising during the Commune. In 1881 he was elected republican member of the chamber of deputies, and in Gambetta's cabinet became undersecretary of state for the colonies. He held the same post in the Ferry, Brisson and Tirard administrations, and in 1894 became minister of marine in the Dupuy cabinet and vice-president of the chamber. In January, 1895, he succeeded Casimir-Perier in the presidency, and during his term was exceedingly popular.



F. F. FAURE

Faust (*foust*), **Dr. Johann,** was a famous magician and dealer in the black art, who lived in the 16th century. He has been made a central character in literature, and became the hero of Goethe's *Faust*. Luther spoke of him as the type of "the infidel and impious man." The story is that he obtained his art from Satan, making a contract with the devil that he should serve him (Faust) for 24 years and at the end of

that time should have possession of his soul. The contract was signed with his own blood. Marlowe and Goethe both made the story the subject of a drama. He is said to have died in 1538.

Faust or **Fust, Johann,** a German printer, born in Mentz, Germany, who was associated with Gutenberg in the first introduction of printing He probably had nothing to do with the invention of printing, but furnished the capital to introduce the new art. The process was kept secret at first, but at the sacking of Mentz, in 1462, Faust's workmen were scattered and the new art became public property. A Latin Bible in the Mazarin library is thought to have been printed by Faust. The probable date of his death, at Paris, is 1467.

Favenc (*făv'en*), **Ernest,** explorer and author, was born in London in 1846 and educated at Berlin and Oxford. From 1865 to 1879 he was a pioneer in Queensland, in 1878 taking charge of the Queenslander expedition from Blackhall to Port Darwin, and he has since been on several minor expeditions in the northern territory and in western Australia. His published works include *The History of Australian Exploration, The Secret of the Australian Desert,* several books of fiction and many scientific pamphlets. Since 1888 Mr. Favenc has engaged in journalism

Faw'cett, Edgar, American man-of-letters, was of English extraction, and was born in New York May 26, 1847, and educated at Columbia College. He began his literary career by publishing some collections of sensuous verse, followed by novels and essays. Of the latter, the better known are *A Gentleman of Leisure, Miriam Balestier* and *A Demoralizing Marriage.* Besides fiction and verse he has written plays and *Agnosticism and Other Essays.* Fawcett died on May 1, 1904.

Faw'cett, Henry, an English statesman, was born at Salisbury, England, in 1833. After graduating at Cambridge he studied law, intending, as he said when a boy, to enter Parliament and to work for all who were "desolate and oppressed." His hopes seemed suddenly blasted, when, while out shooting with his father, the contents of his father's gun entered both eyes, blinding him completely. But, with rare courage, he determined to accomplish, though blind, whatever he had planned to do when he had his sight. He entered Parliament in 1865, where he carried out his early plans of working for the oppressed in many reform-measures for factory children, for the native population of India, for the common people in keeping open spaces, such as Epping Forest and the New Forest for their benefit. He became postmaster-general in 1880, and within a fortnight had inaugurated five reforms the parcel-post, postal orders, a postal savings-bank, postal life-insurance and cheap telegrams. He instituted an annual week's holiday for country-postmen and encouraged the employment of women. He died on Nov. 6, 1884. A national memorial has been erected to him in Westminster Abbey. See Leslie Stephen's *Life of Henry Fawcett.* His wife was a distinguished political economist and publicist.

Fawkes, Guy, a conspirator, born in 1570, concerned in the Gunpowder plot, for which he was hanged on Jan. 31, 1606. See GUNPOWDER PLOT.

Feast. See FESTIVAL.

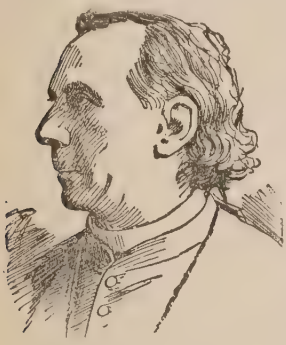
Feathers. No animals but birds possess feathers; they are outgrowths from the surface-layer of cells and correspond to the scales of fishes and the hairs of other animals. They are usually arranged in definite tracts with smooth spots between them. A complete feather is composed of a lower hollow stem or quill, which passes into a four-sided shaft filled with pith. From the shaft barbs spring right and left and carry smaller projections called barbules, which interlock by means of little hooks giving firmness to the vane of the feather. When the barbs are fine, the feathers are soft and downy. Feathers are of two kinds: the contour-feathers that give form to the bird and are compact, and the down-feathers distributed among them. Feathers are formed from a papilla or little knob of cells, that become inclosed in a pocket of the skin, called a follicle. The papilla is richly provided with blood-vessels, and is the germ from which the feather grows. A sort of mold for the outlining of the feather is produced within the follicle, and as it grows it is pushed from the follicle and dries in the air. The quill is inserted into the mouth of the follicle. Moulting or shedding of the feathers occurs annually, usually in the fall. In addition, there is frequently, in the spring, a partial shedding of the smaller feathers. The colors of feathers are due to minute granules of coloring-matter or pigment. Feathers are extensively used in millinery and for stuffing pillows; the quills are used for pens, toothpicks, holding hairs for artists' brushes, etc.

Federal Trade Commission, a board of 5 members, appointed by the president, no more than 3 of whom can be of the same political party. It was organized first in 1915, and has power to investigate and restrain unfair methods of competition and violations of the anti-trust law. Its orders are enforced by the United States Circuit Court of Appeals.

Feeding-Stuffs for stock are commonly classed as concentrates and roughage. The former are those with a narrow nutritive ratio, as grains (see BALANCED RATION); the latter are the coarse forages with much fiber or water. Roughage may be dry forage, as cured timothy, clover, alfalfa, etc. or green forage. The latter may be fed in pasture somewhat before reaching

maturity, or cut and fed green, then known as soiling-crops; or cut and stored in a silo, to remain juicy for winter feeding with dry feed, the material so stored being known as ensilage (q.v.). Animals in pasture need less of concentrated food than those on dry forage; but more can be fed from the same number of acres by giving the soiling-crops to stock under cover. Forage crops include corn, clover, alfalfa, cowpeas, rape, oats and millet. Sometimes more than one are sown together, as oats, peas and rape for hogs, or rape with wheat for pasturage after harvest. If the change from dry forage to green pasturage be too sudden, stock is liable to the trouble known as bloat, due to rapid fermentation of the food. See Henry's *Feeds and Feeding*, Jordan's *Feeding of Animals* and bulletins of Experimental Stations and the U. S. Dept. of Agriculture.

Feehan, Archbishop Patrick A., an American Roman Catholic prelate, was born in County Tipperary, Ireland on Aug. 29, 1829, and educated at Castle Knock and Maynooth Colleges. Emigrating to the United States in 1852, he became pastor of a church at St. Louis and president of a church seminary at Carondelet. In 1865 he was consecrated bishop of Nashville, Tenn., and in 1880, when Chicago was made an archiepiscopal see, Bishop Feehan became its first archbishop. He died on July 12, 1902.



ARCHBISHOP FEEHAN

Feeling. This term is ambiguous, as it may refer to sensations of touch or to the general subjective sense of the pleasantness or unpleasantness of experience. It is in the latter meaning that the word is here used. Feeling is commonly contrasted with cognition, the latter giving the objective qualities of things, *i. e.*, their color, shape, size, causal relations, etc.; the former, the way in which they affect us. Traditional psychology has commonly distinguished between cognition, feeling and volition, as distinct powers or faculties of the mind; but to-day the tendency is to regard all consciousness as involving activity (see CHILD STUDY). Volition therefore is only a type of cognition. When attention is concentrated on a certain act, and one feels willing to do this act and is moreover aware of consent to its performance, the mental state is one of will. It follows that consciousness has two fundamental phases, cognition and feeling, both of which have an important bearing on action. When consciousness involves relatively much feeling and little thought, impulsive, uncontrolled action follows; when the cognitive element increases in proportion, the activity comes under guidance, becomes voluntary. In any case the amount of feeling is a fair indication of the dynamic force of a state of consciousness.

The relation between feeling and cognition has been an interesting question in the history of psychology. Plato assumed that feeling is of two kinds: one dependent on bodily conditions, as the appetite, physical pleasure and pain; the other dependent on ideas, as social, aesthetic and moral feelings The former is base, the latter noble. This view is a common one and is retained by Herbart, who reserves the word *feeling* for the latter class and calls the former emotion; a terminology not preserved by modern psychology. According to Herbart education should strive to control or suppress the emotions, but the feelings should be encouraged, for from them springs interest (q. v.), the dynamic force of learning. Modern psychology finds no essential difference between physical and intellectual feelings, and ascribes to both the same general function in the life of the organism.

Three fundamental problems are involved in the recent psychology of feeling. The first concerns the classes of feeling, the second its conditions and the third its function. As regards classification all distinctions based on the nature of the object that rouses the feeling rather than upon its subjective effect are set aside. Social, ethical, aesthetic, sensuous and intellectual feelings are no longer thought to be distinct varieties. Wundt, the German psychologist, offers the most elaborate classification of pure feeling. He says that we may be affected in six ways, pleasantly or unpleasantly, with excitement or depression, or with strain or relaxation. Other psychologists reject all but the first two, claiming that excitement and depression, strain and relaxation are distinguishable only by means of the kind of sensations involved and are not classes of pure feeling. For instance, strain, they claim, tells us that our muscles are moving with difficulty and not how this motion affects us. It may be either pleasant or unpleasant.

As regards the conditions of feeling we again have much discussion and no certain agreement. It is generally recognized that sensations of ordinary intensity are usually agreeable, whereas those that are either very feeble or very intense are usually disagreeable. Professor Angell adds two other conditions which seem accurately stated and suggestive. He says that whenever the bodily tone is good, normal ex-

perience is pleasant, but the same experience may be very unpleasant to one who is tired or sick. Again, whatever interferes with our purposes, as the failure to recall a name that we wish to use, the inability to see any suggestion looking toward the solution of the problem at which we are working, the recognition that we have omitted an indispensable step in some work that we are carrying on, are all disagreeable. On the other hand, whatever furthers the purposes of the mind is pleasant.

It will be seen that on this basis disagreeable feelings are the spur that incites us to intenser activity in readjusting ourselves to conditions that at present are unsatisfactory, while agreeable feelings encourage this activity when it is successful or seems likely to prove so. Feeling is the stimulating and relative agency in mental life. It is not so much a result of experience as a judgment on its significance and value.

A similar explanation can be given of the function of the emotions. These are very complex mental conditions in which some exciting object, *e. g.*, a dangerous beast, occupies the focus of attention, but the background of consciousness is made up of a mass of organic sensations arising from the general bodily disturbance that constitute reflex reactions to the terrifying object. These organic disturbances consist in changes in the heart-beat, in the circulation and in the activities of the digestive and secretive organs, as well as vigorous expressions of the outer muscles. The emotions are usually toned with very intense feeling. So important are the organic sensations that Professors James and Lange have declared that without them there is no emotion, but merely an indifferent intellectual apprehension of the exciting object. So far, therefore, as we can stimulate or suppress emotional expressions, we can excite or allay the corresponding emotions. This offers a valuable suggestion to the teacher concerning the importance of encouraging the expression of desirable emotions and discouraging that of others.

The organic and external expressions of emotion may both be regarded as instinctive. In many cases their utility is obvious, as in that of flight because of fear or striking from anger. In other cases, although no longer useful, they may have served our ancestors. The paralysis of fear, harmful to us, causes the lower animals to lie quiet and thus escape the observation of their enemies. A still more significant function of emotional excitement is brought out by Professor Dewey, who points out that the violent internal disturbances that cause emotions constitute the condition for an immense amount of experimental activity through which eventually the unusual situation that excites the emotion may be satisfactorily dealt with. Emotion like feeling is thus seen to be a spur to readjustment, and frequently a desirable aid to education. See CHILD STUDY, ADOLESCENCE, INTEREST. Consult James's *Principles of Psychology*, Holt & Co.; Angell's *Psychology*, Holt & Co.; and Ribot's *Psychology of the Emotions*, Scribners.

E. N. HENDERSON.

Feldspar or **Felspar,** a class of minerals always found in granite rocks and, when decomposed, forming clay. It is what is known as a rock-forming mineral, that is, it is one of the substances that crystallize when lavas solidify into firm rocks or when rock-masses become crystalline from heat and pressure. Feldspars always contain silica and alumina, while the other constituent or constituents vary. There are several varieties, known as soda-feldspar, lime-feldspar, potash-feldspar, etc., according to the composition. In granite the color is given by feldspar, and so we have gray, red or pink granites. Some varieties are used in jewelry, because of their hardness, which admits of a beautlful polish, and of their bright colors. Labradorite, so named because found by Moravian missionaries on the coast of Labrador, is one of the most beautiful kinds used for this purpose; so are a variety which is cut into stones known as moonstone and the Amazon stone, a bright green in color, found at Pike's Peak, Col. Of the clay-formed feldspar-rocks, those which have the most feldspar make the finest clays, such as kaolin, and are much used in porcelain-manufacture.

Felix, Antonius or **Claudius,** a Roman governor of Judæa in the time of the Apostle Paul. His wife was Drusilla, according to Tacitus, a daughter of Antony and Cleopatra. He was an energetic ruler, clearing the country of the robber-bands that abounded and holding the seditious Jews in check. When Paul was brought before him as a prisoner, and he heard him "concerning the faith in Christ," he trembled and said: "Go thy way for this time. When I have a convenient season, I will call for thee." When he was recalled in 62 A. D. to Rome, he left Paul in prison to please the Jews.

Fellah (*fĕl'ȧ*), an Arabic word, meaning tiller of the soil. Fellahin are the descendants of the ancient Egyptians, intermingled with Syrians and Arabs. The men are of middle stature, large skull and oval face, thick lips and small hands and feet. The women are slender and graceful, and often of beautiful features. They marry at eleven, become mothers at twelve, and grandmothers at twenty-four. Their food consists almost entirely of vegetables, and their drink is Nile water and coffee. They exhibit the moral qualities of the ancient Egyptians and inherit their traditional hatred against the paying of taxes. See A. B. Edwards' *Fellah and Fellahin.*

Fellowship (*College*), an honor granted by a university to a graduate who shows promise of high attainment, accompanied by an annual stipend. The fellow or recipient of the fellowship is expected to pursue advanced studies in some chosen department of the university. In America these studies usually are along the line of advancement to a higher academic degree. In some instances the fellow is expected to perform some service to the university, as giving a certain amount of instruction, in return for his fellowship. Sometimes traveling-fellowships are given, in which case the fellow has the privilege of using his stipend to visit other universities and pursue his work there instead of at the university granting the fellowship. The income from a fellowship varies from $120 *per annum* to $1,000 and over, the usual value being $500. The custom of giving fellowships is an old one in several European universities, but of recent origin in the United States. In Oxford University, England, a fellowship used to be granted for life, forfeitable, however, in case of marriage or of attainment to a position in the church or upon admission to the bar. In Cambridge University, England, fellowships are now held for six years. In America they are granted only for one year, but often may be renewed for one or two years more.

Felt, a fabric formed without weaving, made principally from wool. The making of it is an ancient art in some parts of Asia, but the first successful mechanical process was invented by J. R. Williams, an American, about 1825. It is made by forming the wool into thin sheets. A number of these are piled together and then submitted to pressure between rollers, some solid and some hollow, containing steam. The rubbing action forms them into a compact cloth, which is held together by the interlocking of the fibers. Such felt-goods as carpets and table-covers are usually printed with patterns in colors. Felt made from furs is used in the manufacture of hats, etc.

Fencing is the art of attack and defence with foils, swords or any weapon employed for cutting or thrusting. The rise of fencing has been due to the introduction of gunpowder, which rendered armor useless and made it more necessary to defend oneself with one's weapon. The rapier was invented for attack alone, and the dagger used for defence. The use of the blade as both "sword and shield" is a later development, which involved the shortening and lightening of the rapier. The Italian style of fencing is active and violent; the French, which is now more popular, is guarded and reserved. German fencing resembles the Italian type. In student-duels a double-edged blade, sharpened near the point, is the weapon employed. In French duels a regular type of small sword, for pointing only and not for thrusting, about 33 inches long, is the ordinary weapon. In fencing, gloves, a leather breastplate and a wire mask should be worn. The foil, which is of steel, is covered at the point by a rubber button.

Some of the terms used in fencing occur so frequently that they should be defined. A *feint* is a movement to mislead. A *riposte* is a thrust made after a parry. A *parry* is a defence against a thrust. The *appel* is a smart stamp of the right foot upon the ground in a retreat or a feint. *Prime* and *quarte* refer to the part of the body to the left of the blade and above the hand, *septime* and *quinte* are also to the left but below the hand. To the right above the hand are *tierce* and *sixte;* while *octave* and *seconde* are on the right below the hand. In a *lunge* the right foot is advanced, the left leg straightened and the arm thrust straight forward from the shoulder. To be *engaged* is to be opposite one another upon guard. To *feel the blade* is to rest one's sword lightly against the sword of the other in order to foretell his next attack. But the eye is ever the best index of such an intention.

Fénelon (*fā-ne-lôn'*), **François de Salignac de la Mothe** a priest of the Roman church, was born in the Chateau de Fénelon, Perigord, France, on Aug. 6, 1651. Early in life he showed signs of great piety, and in his twentieth year entered the newly-founded seminary of St. Sulpice to study for the priesthood, and was ordained in 1675. In 1689 Louis XIV appointed him preceptor of his grandson, the young duke of Burgundy. As an acknowledgment of his merits, the king in 1694 presented him to the abbey of St. Valery and in the following year to the archbishopric of Cambrai. Fénelon was a man of breadth of character and practical piety. In middle life he engaged in a long controversy with Bossuet which ended by a decision of the pope against him, March 12, 1699. The beauty of his character was well-brought out in his taking the first opportunity to publish from his own pulpit the brief of his condemnation. His benevolence, charity and liberality were recognized by the allied army in 1709, which was instructed to spare the palace and stores of the archbishop of Cambrai. Fénelon died on Jan. 7, 1715, and was buried in his cathedral. See Mrs. H. L. Lear's *Life*. His writings include the famous *Adventures of Télémaque* and *Dialogues of the Dead.*

Fe'nians, a political association of Irishmen having for its object the overthrow of British rule in Ireland. The name is said to be derived from an Irish military organization, called Fionna Eirinn, founded by Sedna II about 400 B. C. The modern

Fenian movement had its first seat in America in 1846, the headquarters being New York. Agents were sent to England and Ireland to incite rebellion, but were unsuccessful. Three times Canadian territory has been invaded from the United States in times of peace by bands of Irishmen, seeking to incite rebellion and disorder in fancied revenge upon Great Britain. On March 17, 1866, St. Patrick's day, the militia of the Dominion were forced to guard the frontier. On May 25, 1870, O'Neil crossed the frontier at Trout River in a demonstration against Quebec, to be driven back by the volunteers. The next year an attempt to invade Manitoba ended in force, the United States government following him over the line and arresting him. The Fenian spirit appeared again in 1883 in the Skirmishing Fund, raised to promote the free use of dynamite for the destruction of British shipping and buildings. See J. Rutherford's *Secret History of the Fenian Conspiracy*.

Ferdinand I, the Great, the first sovereign of independent Castile, was born in 1000, and died on Dec. 27, 1065. He became king in 1035 and largely extended his dominion in 1053 by defeating his brother, Garcia III of Navarre, and annexing a large portion of his provinces. Early in his reign he fought against the Moors and extended the Christian frontier by defeating the emirs of Toledo, Saragossa and Seville. He laid claim to the title of emperor of Spain, and a decision favorable to his rights was given at a conference held at Toulouse, so far as they related to the territories which had been conquered from the Moors.

Ferdinand III, king of Castile and sometimes known as Saint Ferdinand, was, on the death of Henry I of Castile, proclaimed king. On the death of his father, in 1230, he also became king of Leon. His energies were chiefly devoted to the prosecution of wars against the Moors, and among his victories are those of Cordova in 1236 and Seville in 1248. He died at Seville on May 30, 1252, while planning an invasion of Africa. Ferdinand III was a champion of the Christian faith, and for his zeal was canonized by Pope Clement X in 1671. His feast-day in the Spanish calendar is May 30.

Ferdinand V of Castile, II of Aragon, III of Naples and II of Sicily, was born in Aragon, Spain, on March 10, 1452. He married Isabella, the sister and heiress of Henry IV of Castile, and they were crowned joint sovereigns of Castile. He was surnamed the Catholic, because of his zeal for Christianity. He drove out the Jews, numbering about 160,000, from his kingdom and ended the Moorish power in Spain (1492). He added Naples and Navarre to his dominion, and united the whole peninsula, excepting Portugal, into one state. He was one of the ablest princes of his age, though crafy, ambitious and untruthful He died on Jan. 22, 1516. The most interesting event of his reign to Americans, the discovery of America by Columbus, owes little if anything to his influence. This honor belongs to Isabella. See Prescott's *History of Ferdinand and Isabella.*

Ferdinand I, emperor of Germany from 1556 to 1564, was born at Alcalá, in Spain, in 1503. He was the son of Philip I and brother of Charles V, whom he succeeded. In 1521 he married Anna, daughter of Ladislaus, king of Bohemia and Hungary; and when her brother Louis fell in battle, in 1526, he claimed the crown in right of his wife. After a series of bloody battles he gained the upper hand, and secured Bohemia to the house of Austria. He died at Vienna in 1564, and was succeeded by his son, Maximilian II.

Ferdinand II, emperor of Germany from 1619 to 1637, was born at Gratz, Austria, on July 9, 1578. It is said that he took an oath to reinstate the Catholic religion in his dominions at any cost. When he became emperor of Germany, he extended this religious war, which had begun in his own duchy of Styria, over a large part of Europe. This was the famous Thirty Years' War. He had subdued nearly all of his subjects and almost stamped out Protestantism, when the great Protestant hero, Gustavus Adolphus of Sweden, appeared upon the troubled scene. The ability of the Swedish generals being more than a match for that of the Austrian generals, the balance of victory reverted to the Protestant arms, and ere Ferdinand died, on Feb. 15, 1637, he had lost all hope of ever attaining his object. His reign is one of the most disastrous in history, for Germany owes him nothing but bloodshed, misery and desolation.

Ferdinand III, emperor of Germany from 1637 to 1657, was the son of Ferdinand II, and was born at Gratz, Austria, on July 11, 1608. His reign was more peaceful than that of his father. He died on April 2, 1657, after having concluded an alliance with Poland against Sweden. He was succeeded in the German empire by his son, Leopold I.

Ferdinand I, king of Naples, an illegitimate son of Alphonso V of Aragon, was born in 1423. He succeeded to the throne in 1458, but was not recognized by Pope Calixtus III, who championed the cause of John of Anjou, and was defeated by him on July 7, 1460. In the meantime Pius II succeeded Calixtus, and Ferdinand, by making certain concessions, obtained recognition and defeated John of Anjou on Aug. 18, 1462. He died on Jan. 25, 1494.

Ferdinand IV, king of Naples, was born at Naples on Jan. 12, 1751, and when his father ascended the Spanish throne in 1759, Ferdinand succeeded him on the throne of

Naples, under a regency. His minority ended on January 12, 1767, and the following year he married Maria Caroline, daughter of Empress Maria Theresa. During the wars of Napoleon Ferdinand was forced several times to leave his country, but was finally recalled to his capital on Dec. 12, 1816. He died on Jan. 4, 1825.

Ferdinand VII, king of Spain, was born on Oct. 14, 1784, and became prince of the Asturias in 1788. For political reasons his father, Charles IV, was forced to abdicate the throne, and Ferdinand was proclaimed king on March 19, 1808. When Napoleon invaded Spain, he forced Ferdinand to resign, and Joseph Bonaparte was proclaimed king in his stead. Wellington's victory at Vittoria on June 21, 1813, induced Napoleon to treat again with Ferdinand, and as a consequence he recognized his title to the throne of Spain, one of the conditions being that the English were to be expelled from the peninsula. Ferdinand was continually in open conflict with the Cortes, and his death at Madrid in 1833 was signalized by the outbreak of a long and bloody civil war. Ferdinand VII was one of the most incompetent monarchs that ever reigned. During his sovereignty Spain lost New Granada, Mexico, Rio de la Plata, Chile, Venezuela, Guatemala and Peru.

Fer'guson, James, a self-taught astronomer, was born near Keith, Scotland, in 1710. When he was eight, his father, in repairing the roof of their cottage, which had fallen in, used a lever and fulcrum. This at once interested the boy, and he began to experiment with levers, to which he added a wheel and axle. Apprenticed to a farmer, he studied the stars while watching the sheep by night. He made a wooden clock, and helped to support himself by repairing clocks and taking portraits in India ink. He received a small pension from George III, and died, probably in London, on Nov. 16, 1776. He invented astronomical machines, and wrote works on astronomy, among them *Astronomy Made Easy*. See *Autobiography* and *Life* by E. Henderson.

Fer'menta'tion, the decomposition of certain substances by the action of living plants either directly or though the enzymes (which see) secreted by them. All fermentable substances are complex carbon-compounds, especially carbohydrates (such as sugars) and proteids (abundant in white of egg, meat, curds, etc.) The fermentation of proteids and other nitrogenous substances, usually accompanied by evil-smelling gases, is often called putrefaction, but it does not differ in nature from other fermentations. Gases are a common product of fermentation, but not a necessary one. All protoplasm appears to have the power of producing fermentation under certain conditions. Many plants can in this way, instead of by normal respiration, secure energy sufficient to maintain life for some time without free oxygen. Ripening fruits, as pears and apples, and chopped-up plants, as fresh ensilage, show energetic fermentations of this direct kind. During such periods the usual functions of the plant are retarded or suspended, in which they differ from the lower organisms. The decomposition of foods in digestion is not ordinarily thought of as fermentation, but it is impossible to distinguish the two clearly.

A number of plants of the simpler sorts, notably yeasts, certain moulds and most bacteria, produce conspicuous fermentations, each after its kind. They therefore are called ferment-organisms or, formerly, ferments. As enzymes were also called ferments, the two were distinguished as organized and unorganized ferments. Since many of the ferment organisms act as such by secreting enzymes (*e. g.* yeast), the distinction is invalid.

Fermentations usually take their names from the most striking products. Thus, yeasts and some moulds work *alcoholic* fermentation in sugary liquids, forming alcohol, carbon dioxid and several less important products; certain bacteria cause the souring of milk on account of the formation of lactic acid, etc. (lactic F.); others form acetic acid, etc. (acetic F.) from alcohol, as when wine or beer sours. Many other forms of fermentation occur, the products of one being the material for subsequent decomposition. Some fermentations, especially the alcoholic ones, are of much economic importance. Thus the making of bread, wine, beer, vinegar, butter and cheese is dependent upon the proper action of the ferment-organisms that grow in these substances. Many household and commercial processes, as canning, cold storage, etc., are to prevent the growth of ferment-organisms. C. R. BARNES.

Ferments. See ENZYMES and FERMENTATION.

Fern, a flowerless plant growing from a rootstock, producing spores instead of seeds, the leaves or fronds usually raised on a stalk. The notable fern-families include the tall swamp-ferns; coarse ferns; large and coarse ferns of swamps and woods; small and medium-sized ferns; delicate rock or wood-ferns; shield-ferns. The brake is the most widely distributed of the ferns; in Oregon it sometimes reaches a height of seven feet. The delicate maidenhair is one of the most highly regarded ferns, its haunt dim, moist woods. The tiny leaves on the slender black stem suggest fragility, but this fern will bear transplanting if a shady, damp corner is provided for the replanting. The evergreen wood-fern, a feature of our northern woods, flourishes throughout the year; it

varies from a few inches to three feet in height. As a rule ferns other than the evergreens are not to be seen until the latter part of April, at which time the rolled-up fronds appear; some well-protected in warm wrappings, some quite naked. By May they show in their beauty of delicate tracery and fresh greenness; by June they are well-grown; by mid-July they are in most luxuriant leafage and many in fruit. August is considered the best month in which to search for our rare ferns. In the fall the hardy brake turns brown and withers soon; most of the other ferns follow the fashion of the trees in the matter of autumn coloring. See Parsons: *How to Know the Ferns.* See FILICALES.

Fernando Po. See SPANISH AFRICA.

Fernie, a town of 3,500. It is 65 miles east of Cranbrook on the Crowsnest Pas. Railway. It is noted as being the center of the coal-mining industry for this part of British Columbia. The coal-mines in and near the town are practically inexhaustible. The demand for coke and coal is daily increasing, and this ensures continued growth and prosperity for the town. Toronto capitalists largely control the coal industries at Fernie.

Ferrara (*fĕr-rä'rä*), capital of the province of the same name, in Italy, is situated on the River Po, 30 miles from the Adriatic. The most noticeable building is the ducal palace of the Estes, built in the 14th century. It is remarkable for its art-associations. Under the dukes of Este it produced a good school of painters, and in literature it is closely associated with Tasso, Ariosto and Guarini. The university, founded in 1264, has a library of 100,000 volumes. Ferrara was the birthplace of Savonarola. At the period of its greatest prosperity it had a population of over 100,000, and now has 82,310 inhabitants.

Ferret, a small, slender animal of the weasel family, closely allied to the polecat. Its color is usually a yellowish white, its length about 14 inches, and tail 5½ inches. It originally was imported into Europe from Africa. It is used in rabbit-hunting to drive rabbits out of their holes and also as an aid in getting rid of rats and mice. Even though raised in confinement, it never becomes really tame or trustworthy. Like the weasel it will make sad havoc in a poultry-yard, merely sucking the blood of the fowl it kills. It has been known to do serious injury to infants. Unlike the polecat, it is very sensitive to the cold.

Fer'ry, a passage by boat across water. Ferry-boats are made large to accommodate both foot-passengers and horses and carriages. They are either rowed across or drawn by a cable. Steam is also used to propel them.

Ferry, Jules François Camille, French statesman, was born at St. Dié in the Vosges, France, April 5, 1832. After being admitted to the bar in 1854 he allied himself with the opponents of the empire and carried his hostility into journalism. He was elected to the legislature in 1869 and voted against the war with Prussia. He formed a cabinet in September, 1880, which remained in office until November, 1881, and he again became premier in 1883. He was defeated in 1885, on account of his foreign policy, which involved disaster to the French troops in Tonquin. He died at Paris on March 17, 1893.

Ferryland, an electoral district of Newfoundland. Population 5,697; chief towns, Ferryland, Renews, Fermense, Witless Bay, Cape Broyle and Bay of Bulls.

Fertiliza'tion (in plants). The act of union of the male and female cells, commonly known as sperms and eggs. Among plants the name is technically applied only when the sexual cells can be distinguished as male and female. When the sexual cells are alike in appearance, the process is spoken of as conjugation. The word fertilization, however, in a general sense covers the whole sexual process, and fertilization is present in all plants excepting in the very lowest thallophytes. The real significance of the process is not understood, since asexual methods of reproduction are often more common. The result of the union of the sperm and egg is the formation of a sexual spore, known in plants as the oöspore or fertilized egg, by which a new plant is developed.

Fer'tili'zers are materials added to the soil to replace those taken from it by plants, or, in a broader sense, added to affect its physical nature. They may be commercial fertilizers, barnyard manures, compost or green manures. The element most likely to be lacking is nitrogen; after that phosphoric acid and potash. Nitrogen is needed especially to produce stem and foliage, potash for flowers, fruit and seed, and phosphoric acid for general plant-vigor. The most valuable source of nitrogen is nitrate of soda, commonly known as Chile saltpeter; muriate of soda is obtained principally from deposits in Germany; and phosphoric acid from lime-phosphates, abundant in the southeastern states and usually requiring special chemical treatment to make the acid available to the plant. Other sources of these substances are cotton-seed meal, slaughter-house tankage, dried blood, dried fish, bone, wood-ashes, tobacco-stems, horn and hoof shavings and leather-scraps. The plant-food in these varies in amount, and its availability varies according to the rapidity of their decay. Most states require on each package a guaranteed chemical analysis. But a fertilizer made up largely of leather-scraps or horn shavings would show a high percentage of nitrogen, but be of little

value. The wise farmer buys his own raw materials and mixes them in proportion to suit his own crops and conditions. Commercial fertilizers are applied to fields dry, being spread broadcast and worked in or drilled in. The amount usually applied is from 400 to 600 pounds per acre. Ten pounds of nitrogen per acre furnished by a fertilizer are the least amount that will give satisfactory results; likewise 15 pounds of soluble phosphoric acid; and 20 pounds of potash. Such fertilizer is applied in gardens and lawns, either dry or in solution. The following complete fertilizer is recommended: ¼ pound nitrate of soda, one pound of acid phosphate, ½ pound muriate of potash, for every 100 square feet of garden. Lime acts principally to change physical conditions, compacting sandy soils and making stiff clay-soils loose. It also exerts some chemical influence. For barn-yard and green-cropping manures see MANURES, NITROGEN-GATHERING CROPS and ROTATION OF CROPS. See Robert's *Fertility of the Land*, Snyder's *Chemistry of Soils and Fertilizers* and bulletins of state experiment-stations and the U. S. Dept. of Agriculture.

Fes'senden, William Pitt, an American statesman, was born at Boscawen, N. H., on Oct. 16, 1806. He was elected in 1832 to Maine's legislature as a Whig, and in 1854 the Whigs and free-soil Democrats elected him to the United States senate. He became one of the leaders of the newly organized Republican party, and was a member of the peace congress in 1861. He was secretary of the treasury from 1864 till his resignation in 1865, when he again entered the senate. He was ranked among the first lawyers of the United States, and had few superiors as a debater. He died at Portland, Me., on Sept. 1869.

Fetich (*fē'tĭsh*), an article of worship capable of being appropriated by an individual. It is not strictly an idol, but the dwelling-place of a spirit. Flints, shells, claws, feathers, earth, sand, plants, trees, mountains may become fetiches, provided the belief exists that a spirit is lodged within them. They are attached to individuals, families and tribes. Crooked sixpences, horseshoes and four-leaved clovers, as used for "luck," are very much like the fetiches of savages. The worship of fetiches is called fetichism. See A. B. Ellis' *Tshi-Speaking People of the Gold Coast.*

Feu'dal System in the middle ages formed the connecting link between early society and the modern reign of law and order. It was based on the holding of land, and the result of the system was the establishment of the various great European powers on the ruins of the Roman empire. The feudal theory was that the king was the absolute owner of all the land in the kingdom; the chief lords held their lands from him on the condition of military service. Such was the principle of the system that prevailed over France and Germany at the time of the Norman conquest. William I introduced feudalism into England, where it prevailed in some form or other until the restoration of Charles II. The remains of the feudal system may be seen on the banks of the Rhine better than anywhere else. There are the castles of the feudal baron, the villages of his dependents and the church whose priest was his tenant. See Seebohm's *The English Village Community.*

Fez, the second capital of Morocco, is situated in a valley on the northwestern side of the Atlas Mountains. The city is surrounded with walls from 30 to 40 feet high, and with towers at intervals for cannon. The streets are narrow and unpaved, and the houses low, but their interiors often are very beautiful. There are large palaces for the sultan, and 11 large mosques, one, the mosque of Karubin, being of immense size, with 800 pillars. Tanning, weaving, pottery, fez-caps and morocco leather, particularly the red, are among the manufactures. The university, founded in 859, is one of the oldest and largest in North Africa, and at present has about 700 students with 40 professors. The population is estimated at about 140,000, made up of Arabs, Berbers, Jews and negroes. Fez was founded in 808, and has for many years been the sacred city of the Mohammedans. See De Martinière's *Morocco* (English translation).

Fezzan (*fĕz'zăn'*), a province of the Turkish empire, attached to Tripoli. It extends 390 miles north and south and 300 miles east and west. Its area is about 150,200 square miles. The inhabitants of the province number about 50,000, and are a mixed race. They are frivolous yet honest, and are notorious for their immorality. The principal town is Murzuk, having a population of about 6,500. Fezzan belongs to the desert-region of North Africa. See Barth's *Travels in Central Africa.*

Fiber, a substance resembling a thread or bundle of threads, which is either of animal or vegetable origin, except asbestos, the only mineral fiber known. Fiber is used in manufactures, and its value depends upon the structure, strength, elasticity, length, fineness and ability to absorb colors, as in dyeing. Human hair and horsehair, which are fibers, are not very useful in manufactures, because they are too smooth to hold together when twisted into a yarn. Fibers of wool, silk, cotton and flax have projections seen only under a microscope; or they will twist and curl, so that when made into yarn (or thread) they will not untwist. Among animal fibers used in the arts are wool, fur and silk. Vegetable fibers come from different parts of plants.

From the bark of some we have flax, hemp, jute and the material for paper. Cotton-fiber, the most valuable fiber known, consists of the hairs which surround the seeds of the plant. Coir fiber is from the husk of the cocoanut. From the leaves of palm-trees we have a fiber used in making ropes, mats, matting and Panama hats.

Fibre-Industries. The chief fibre-manufactures are those which involve the making of cloth; but the making of brushes, brooms, ropes, cords etc. must also be classed under fibre-industries. Many fibre-industries are not commercial but purely local; for example, the use of grasses and palm-leaves in the building of houses and the manifold uses of the bamboo. The United States import over $30,000,000 worth of raw fibre per year, and several times this quantity of manufactured fibre. For details of fibre industries in the United States see *United States Department of Agriculture, Fibre Investigations, Report No. IX.*, Washington, 1897. See COTTON, FLAX and WOOL.

Fichte (*fik'te*), **Johann Gottlieb,** a great German philosopher, was born near Bautzen, Germany, on May 19, 1762. He studied at the University of Jena, first theology and then philosophy. In 1791 he met Kant, whose disciple he had become. The publication of his *Critique of all Revelation* brought fame at once, and the appreciation of Kant, who had before treated him coldly. He held the chair of philosophy at Jena and also at Erlangen, and was appointed by the king to draw up a constitution for a new university at Berlin, of which he was elected rector, with such associates as Humboldt, De Wette, Schleiermacher and Neander. In 1813, during the war of independence, Fichte's wife volunteered her services as nurse in the crowded hospitals of Berlin, and, after five months of devotion to the sick, she was taken with the fever herself. She recovered, but her husband caught the infection, and died at Berlin, on Jan. 27, 1814. Fichte's *Address to the German Nation* and lectures *On the Nature of the Scholar*, are among his most famous as well as popular works. In philosophy he formed no school, but his influence on German philosophy and, through the writings of Carlyle, on English thought has been important. *The Vocation of the Scholar*, *The Vocation of Man*, *Characteristics of the Present Age* and *The Way to the Blessed Life* are among his philosophical works which have been translated into English. See *Memoir*, by Dr. William Smith, prefixed to a translation of his works; also *Life* by Adamson, in Blackwood's *Philosophical Classics*.

Fidelio or **Conjugal Love.** Beethoven's sole opera; known also as *Leonora*, for which four overtures were composed. First produced at Vienna, on Nov. 20, 1805, a revised edition, approved by Beethoven, was brought out in 1814, when the overture in E was first played. Imperfectly understood during the composer's life time, it now is regarded as one of the noblest types of musical dramatic art.

Field, Cyrus West, an American merchant and scientist, a brother of David Dudley Field, was born at Stockbridge, Massachusetts, on Nov. 30, 1819. He went to New York at fifteen, beginning life as a dry goods clerk at $50 a year. He built up a prosperous paper-manufacturing business, in which he was engaged for twelve years, leaving it in 1854 to enter upon his great work, the laying of the Atlantic cable. Devoting himself entirely to the task of "mooring the New World alongside the Old," he formed stock-companies, crossed the ocean repeatedly, and made every effort to interest the public in the scheme. The first successful cable was laid in 1858, but failed after being in operation a few weeks. He continued the struggle for twelve years, and at last, in 1866, established telegraphic communication between the two continents, which has never since been interrupted. Congress voted him a gold medal and the thanks of the nation, and John Bright called him the Columbus of modern times. He afterward helped to develop the elevated-railroad system in New York. He died at New York on July 12, 1892.

Field, David Dudley, American jurist, was born at Haddam, Conn., on Feb. 13, 1805, and died at New York, on April 13, 1894. He was educated at Williams College, and in 1828 was admitted to the New York bar. In the forties and fifties he took active interest in civil and criminal procedure, and in 1847 was appointed commissioner on practice and pleadings. In 1857 he was employed by New York state to prepare a political, penal and civil code, which was enacted into law. In 1873 he presented to a social science congress outlines of an international code, which was translated into several languages, and resulted in the formation of associations for the reform and codification of the laws of nations. See his collected *Speeches, Arguments and Miscellaneous Papers*.

Field, Eugene, American journalist, styled the Poet Laureate of the Children, was born at St. Louis, Mo., on Sept. 2, 1850. He studied at Williams College, Knox College (Galesburg, Ill.,) and the State University of Missouri, after which he for a time traveled in Europe. His first newspaper work was with the St. Louis *Journal* in 1873. He held positions later on papers in St. Joseph, Kansas City and Denver. In 1882 he became connected with the *Chicago Morning News*, afterward *The Record*, and here his best work was done. His poems on subjects relating to childhood gave him his widest fame. His *Little Boy Blue*, *Wynken Blynken and Nod*, *Jes' fore Christmas* and *Seein'*

Things are all familiar to school-children. His own seven children were the joy of his life. It would be difficult to name in American literary ranks a name more dear to letters than was Eugene Field. His prose-writings were marked by delicate sentiment and delicious humor, while personally he had a wide circle of friends who regarded him with affection and cherish his memory. In verse his work had the touch of the true poet—daintiness and pathetic beauty. His publications include *A Little Book of Western Verse; With Trumpet and Drum; Echoes from the Sabine Farm; Culture's Garland;* and, in collaboration with his brother, *Love Affairs of a Bibliomaniac*, etc. He died at Chicago on Nov. 4, 1895.

EUGENE FIELD

Field, Marshall, merchant and philanthropist, born at Conway, Mass., 1835. For a time he was a clerk in a store in Pittsfield, Mass., but in 1856 he secured a clerkship in a Chicago dry-goods store, and from 1860 to 1865 was junior partner in the firm. In 1865 he became a partner of the firm of Field, Palmer and Leiter, later Field and Leiter. In 1881 he became proprietor of the business, which was thenceforward conducted under style of Marshall Field and Company.

His business grew rapidly with the growth of Chicago and the development of the western country. At his death in 1906 he was head of one of the largest and best-known department-stores in the world. His business, which exceeded fifty million dollars a year, included a large wholesale as well as retail trade and the control of many factories in Europe and Asia and even Australia for the manufacture of the goods he sold. Fortunate investments in Chicago real-estate and in industrial and railroad stocks contributed much to the increase of his wealth. He gave eight million dollars to Field Columbian Museum of Chicago and to the University of Chicago a valuable piece of land for the purpose of athletics, now known as Marshall Field.

Field, Stephen Johnson, American jurist, brother of David D. and Cyrus Field, was born at Haddam, Conn., on Nov. 4, 1816, and died at Washington, D. C., on April 9, 1899. A graduate of Williams College, he studied law, and in 1849 settled in California, where he became member of the state legislature, and in 1859 was elected to the supreme court of the state. In 1863 he was appointed an associate-justice of the United States supreme court. He later was professor of law in the University of California, and acted as a member of the Hayes-Tilden electoral commission. In 1880 he was a candidate for the presidential nomination and received 65 votes in the convention. In 1897 he retired from the supreme court. He died on April 9, 1899.

Field'ing, Henry, a great English novelist, was born at Glastonbury, England, on April 22, 1707. He studied at Eton and at Leyden University. He began his literary career by writing comedies, *Love in Several Masques* being the first and among the best. He managed a theater for awhile, and also studied law and edited several newspapers. But his fame rests upon his three novels, *Joseph Andrews*, written in 1742, in ridicule of Richardson's *Pamela*, which had just appeared; *Amelia;* and the famous *Tom Jones*. Scott calls him the Father of the English novel. He died at Lisbon, Portugal, on Oct. 8, 1754, and was buried in the English cemetery there. See *Life*, in the English Men of Letters series, by Austin Dobson.

Fielding, Hon. William S., born and educated in Halifax, Nova Scotia. He engaged in newspaper work in Halifax for 20 years, was elected to the Nova Scotia Assembly in 1882, and was Premier from 1884 to 1896. He became a member of the Federal Government in 1896, taking the position of Finance Minister of the Dominion. He introduced the preferential tariff in favor of Great Britain. He was Canadian delegate to the Colonial Conference held in London in 1902, and negotiated jointly with the Hon. L. P. Brodeur the Franco-Canadian Treaty. His budget speeches clear, concise, suggestive, constructive, have won for him a great reputation in Canada.

HON. WM. FIELDING

Fig, the fruit of *Ficus carica*, which is native to Asia. The genus is an enormous one in the tropics. There are about 150 different varieties of cultivated figs. The finest figs are the so-called Smyrna figs, which are grown in the eastern Mediterranean region. Figs have been cultivated on the Pacific coast for more than a century. The cultivation of figs in California has attained large proportions. The commercial fig is the dried fruit, although where grown the fresh figs are used. One of the old fig-trees of California rises 60 feet, its

trunk measuring 9 feet. There are three crops a year, the second the most important. The tree has few insect-enemies, and is considered one of the most beautiful of fruit trees. It grows readily from cuttings, and is propagated also by budding, grafting and seeds. The highly-regarded Smyrna figs, now successfully grown in California, do not bear staminate flowers, and near the trees it is necessary to plant the wild or Capri figs, which alone of the figs bear staminate flowers. To obtain pollination, the fig-wasp, which inhabits wild figs and visits the cultivated fig, has been brought into the country.

FIG PLANT
Fig. *a*. Fruit shown in section

Fiji Islands (*fē'jē*), a group of islands belonging to Great Britain, situated in the South Pacific. Their nearest neighbors are the Friendly Islands, 200 or 300 miles southeast. They are 4,700 miles from San Francisco. They lie in a ring, open on the south, and number about 200. The area is 7,435 square miles, nearly the size of Wales. They are of volcanic origin, and are surrounded by coral reefs, are well-supplied with harbors and rivers, possess a rich soil and fine climate, but suffer from hurricanes and earthquakes.

Natural Resources. With the exception of the pearl-shell industry, the resources are almost entirely agricultural. Bananas, bread-fruit, cocoanuts, sugar, corn, cotton, tea and coffee are among the products. There are hardly any native animals and few minerals.

Races. The people belong to the Polynesian race, and until the introduction of Christianity, were fierce cannibals—the terror of the sailors in those regions.

Manufactures. Considerable distilled spirit is manufactured, and there are six sugar-mills, one tea-factory, one soap-works, two saw-mills and 17 boat-building yards.

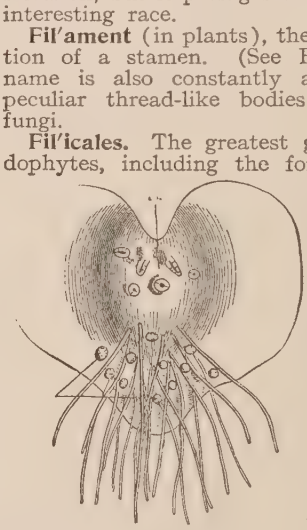
Commerce. Fiji is in regular communication with New Zealand, Australia, Canada, Honolulu, Tonga and Samoa. A subsidized steamer trades regularly within the group. There are an overland telephone from Suva to Lautoka, 120 miles long, and a telegraph between Suva and Levuka, 45 miles by land and 12 by submarine cable. The principal exports are sugar, bananas and fruit, copra and *beche-de-mer;* the principal imports, textile fabrics, hardware and iron, machinery, coal and timber. Maize is grown in exportable quantities.

History. The islands were discovered by Tasman, the great Dutch sailor, in 1643. Turtle Island was discovered by Captain Cook in 1773. In 1835 Wesleyan missionaries came from Tonga and began the wonderful work which resulted in the Christianizing of the islands. The Wesleyans now number about 100,000, and the Catholics 10,000. Since 1858 the islands have been governed by Great Britain, though not formally taken into her dominions until 1874.

Population. The total estimated population on Dec. 31, 1909, was 133,831, divided between Fijians, Rotumans, Indians and whites, the last numbering 2,459. In 1903 births among Fijians numbered 3,431, and deaths 3,298, while the Indians showed 910 births to 545 deaths and the whites 89 births to 37 deaths. Part of this is due to the fact that the population other than native has already undergone a process of selection, but it presages the passing of an interesting race.

Fil'ament (in plants), the stalk-like portion of a stamen. (See FLOWER.) The name is also constantly applied to the peculiar thread-like bodies of algæ and fungi.

Fil'icales. The greatest group of pteridophytes, including the forms commonly known as ferns. About 4,000 species of ferns are known, the large majority occurring in the tropics, where ferns of great size grow, including the well-known tree-ferns. The ordinary ferns of the temperate regions consist only of leaves above the surface of the ground, these leaves arising from a subterranean stem. On account of what seemed to be the peculiarity of a leaf rising directly out of the ground, the name frond was once given to fern-leaves. Usually upon the under surface of these leaves the so-called fruit-dots appear, which technically are known as the sori. Each sorus or dot consists of a group of sporangia, each sporangium containing numerous spores. The sori are often protected by a flap which is an outgrowth of the epidermis and is known as the indusium. Occasionally, as in the maiden-hair fern and common bracken, the sori are along the leaf-margins,


FERN PROTHALLIUM

and these margins inroll to protect them. Each sporangium is a spore-case upon a slender stalk, and about the case a ring of thick-walled cells is developed, known as the annulus. This ring of cells aids in rupturing the sporangium wall and discharging the spores. When a spore germinates, it develops a minute, flat, green

SORI OF VARIOUS FERNS

plant known as the prothallium, which bears the sex-organs. The prothallium, therefore, is the gametophyte. By the union of the sex-cells (sperm and eggs) the fertilized egg is produced, which upon germination gives rise to the well-known fern plant, the sporophyte. In the fern, therefore, the alternation of generations is very distinct, the gametophyte and sporophyte being independent of one another, so far as nutrition is concerned.

Fill'more, Millard, thirteenth president of the United States, was born at Summer Hill, N. Y., on Feb. 7, 1800. In 1819 he began the study of law; in 1823 he was admitted to the Buffalo bar; in 1828 he began his political career. In 1848 he was made Whig vice-president of the United States, and upon the unexpected death of President Taylor, in July, 1850, succeeded to the presidency, which he held until 1853. In 1856 he was nominated for the presidency by the American party, but received the electoral vote of Maryland only. He died at Buffalo, N. Y., on March 7, 1874.

MILLARD FILLMORE

Fil'ter, a vessel arranged for purifying water or other liquids. When water or some other liquid is passed through a substance, the pores or openings of which are too small to allow the solid particles to go through, they, of course, are kept back and the water is cleared The familiar process of straining is a good illustration of the principle of a filter. For home use, a simple water filter is often made by stuffing a sponge in the hole of a flower-pot, then a layer of pebbles, then one of coarse sand and one three or four inches deep of powdered charcoal, with a second layer of pebbles on top. The pebbles and gravel form the strainers, while the charcoal purifies by absorbing impurities, for which it has a special affinity. The charcoal needs to be renewed occasionally, as it loses its power, and the sand and gravel need cleansing. All filters, therefore, made on this principle, should be easily opened, so as to reach all parts. Water is often filtered, before entering a cistern, by an external filter, or in the cistern itself by means of a division-wall of brick, the water passing through the pores of the bricks. An excellent method of filtering water, devised by Pasteur, consists in forcing the liquid through unglazed porcelain. The process is slow but very effective. Special filters are required for syrups, oils and the like. Oil is passed through bags made of horsehair or canton-flannels; syrups through bags of flannel. Ale, beer and such liquids are difficult to filter, and usually need an addition of some clearing substance, as gelatine. The use of filters in the laboratory is important and extensive. Here the material used for filtering is usually paper which is manufactured for the purpose.

Finch, is the popular name for a large variety of birds, which for the most part belong to the scientific family *Fringillidae*. The birds called finches are for the most part small, often beautifully colored and not seldom endowed with the gift of song. In the United States and Canada there are said to be 135 kinds of finches; and there, indeed, is no tropical or temperate country in which finches are not found, although some scientists have wrongly excepted Australia, where, in fact, finches are plentiful. The indigo-bird, purple finch, horse-finch, American goldfinch, pine-finch, grass-finch and rosy finch are among the best-known species in this country. Canaries and sparrows are also classed as finches.

Findlay, the county-seat of Hancock County, in northwestern Ohio, in 1885 received a considerable impetus from the discovery of extensive supplies of natural gas. Besides, there are oil, rich deposits of gravel and sand and beds of clay. Of late it has not grown much, though it has a number of industries, including glass-works, pressed-brick works, potteries, foundries, machine-shops, carriage, tool, furniture, and wooden-implement factories, rail and rolling-mills and an oil-refinery. The city has some fine civic buildings and a number of churches; it contains Findlay College and has excellent public schools. It is served by three railroads, and has all the adjuncts of a modern city. Population 14,858.

Fine Arts. We have spoken of art as nature working through man's intention. It has also been defined as the doing, making or putting together of things by human skill to fit the purpose intended.

The definition of the useful and the fine arts has often been attempted by a contrasting of the meanings of the words fine and useful. This method may, however, leave opportunity for the interpretation that all fine arts are useless arts or that all useful arts are inferior arts. Modern thinking does not, however, admit of the fineness of useless things nor of the inferiority of useful ones. From what we have determined above, and what we know of the meaning of the word useful, we may easily define the useful arts as those doings, makings or puttings together, by which man supplements nature in providing the things which he *knows* he needs. The useful arts must, therefore, address themselves to and spring from man's reasoning power. Now it is quite possible, when all is said and done, that the fine arts deal with things no less important to man than those of the so-called useful arts. The distinguishing characteristic, however, which we observe in the case of the fine arts, is that here the doings, makings or puttings together address themselves to man's emotions — that they spring from his instincts or impulses rather than from his intellect. In the useful arts man is conscious of the need he is endeavoring to satisfy; in the fine arts he knows only that he is impelled to sing or dance or paint. It is quite conceivable that the only difference between these two forms of art is that they knock at different doors.

Man shudders with the cold and rain, or suffers from the sun's heat, and builds a roof and four walls within which to live. He has produced a work of useful art — the useful art of architecture. His house expresses his need of protection from the elements by tacitly meeting that need. But suppose he makes his roof project, so that a deep shadow will fall upon the walls when the sun shines, and that he makes the chimneys large, so that the house will not only be but *seem* to be a place of shelter and of warmth; and suppose that his columns be made broad at the base and lightened with decoration at their tops so that they seem to *prefer* to stand on end, as they do, and support the roof that is above them; then the house does more than merely withstand the elements, it goes so far as *to celebrate its triumph over them.* This is the *fine art* of architecture. Here we see *architecture* as a form of emotional expression — a language of the feelings. This very theme of triumph, it may be observed, has been sung, not in this art alone, but in every form of fine art. From the first aboriginal song and dance down to the days of the Sousa March, triumph has found expression in the fine art of *music.* In the days of the Romans and before and since it has been celebrated in the fine art of sculpture. In the days of the Egyptians as in our own the theme has been voiced through the fine art of *painting*; and in all times the fine art of *poetry* has made it the burden of its lay. So the common ground of the fine arts is the expression of the emotions.

Fine art may well be defined as a species of universal language. The joy, pain, devotion, scorn, patriotism, defeat or triumph which the poet felt who wrote the sonnet is felt again by the person who reads the sonnet. Fine art in other words, means a doing or acting, not on the part of the artist alone, but on the part of the appreciator as well. This is exemplified in dancing, which is a form of musical appreciation, and in which the listener becomes very evidently a part of the performance — coworker with the composer. Arthur B. Davies says: "When I paint a wave I *am* that wave." True. And it is quite as true that when you look at his painting of the wave *you* are that wave. When he sweeps his brush up over the canvas, he feels himself doing just what the wave is doing — he becomes, as he says, a sort of conscious wave; when you sweep your eye over the lines where his brush has led, you too, become a sort of acting, conscious wave. Ruskin describes a wave as "a flint cave — a marble pillar — a passing cloud." Here we have the principle which has just been stated, applied to poetry. We find ourselves, as we read, living the life of the wave, sharing its bygone past, its rushing present and its unknown future. When we hear Shakespeare's *Hamlet* into which, as we know, the author introduced many variations from historical fact, we, by reason of those very changes and interpolations, live the thing ourselves and slip into the emotions of its characters, as it were, so that they are our own emotions. When we read an unadorned statement of the historical facts upon which Shakespeare based his play, we get a far more positive knowledge of the precise things which did take place. We contemplate causes and effects, and make psychological or sociological deductions from them. We study the affair in an unprejudiced manner and wholly from without. And now we have described the two great forms of truthtelling. The first addresses itself to the senses or the feelings, springs from the emotion, and is comprehended by a reliving of it. This is fine art. The second is expressed in terms of reason, in terms of the intellect, and is understood through contemplation — a weighing and measuring of it. This is science. Neither one is the whole

Painters of Common Life

Louvre
The Gleaners, by Jean Francois Millet
(French b. 1814)

The Artist's Descriptions of Scenes and Character

PAINTINGS which deal with common life, or are notable for their emphasis on detail, belong to the "genre" type. Genre corresponds to realism in literature. We here reproduce what by many is regarded as Millet's masterpiece and four other examples of genre. The original of "The Torn Hat," by Sully, is in the Boston Museum. Contrast this typical boy, by an American artist, with the "Dutch Girl," by Rembrandt, and both with the timid little French girls in the picture below.

Thistle Print © Detroit Pub. Co.
The Torn Hat, by Thomas Sully
(American b. 1873)

The Sense of Touch, by Teniers
(Dutch b. 1610)

Chicago Art Institute
Portrait of a Girl, by Rembrandt
(Dutch b. 1606)

From His Series on French School Life.
Primary School for Girls in Brittany, by Jean Geoffroy (French b. 1853)

Painters of Common Life

From a Steel Engraving
Kept In, by Erskine Nicol
(Scotch b. 1825)

Pictures That Tell Stories

With what delight and with what profit children in school make stories about such pictures as those on this page every teacher knows and every parent *should* know. In "Kept In," for example, the good-hearted old school master isn't half so fierce as he is *trying* to be—with his pursed-up lips. The boy knows it. The battle is already more than half won and he has a piece of string ready for his confiscated top on the desk, when he gets it back. Notice that he has his hat and his books in his hand all ready to go.

"Breaking of Home Ties" is widely used in school work because of its emphasis on the sweetness of home life. No other picture attracted so much attention at the Chicago World's Fair where it was first exhibited.

The Pet Bird, by Meyer Von Bremen
(German b. 1813)

By Permission of Taber-Prang Art Co., Springfield, Mass.
The Doctor, by Luke Fildes (English b. 1844)

© *C. Klackner, New York*
Breaking Home Ties, by Thomas Hovenden
(American b. 1840)

© *Photogravure Turner Art Co.*
Girl With Cat, by Paul Hoecker
(German b. 1854)

Natural History in Art

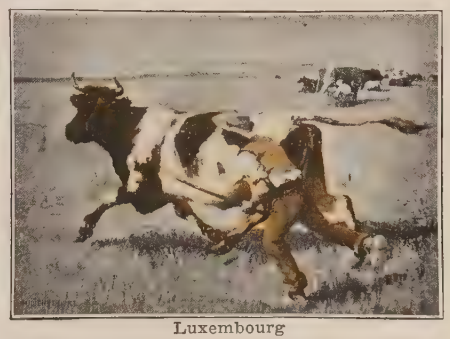
Work of the Animal Painters

©Turner Art Co., Boston

Saved, by Sir Edwin Landseer
(English b. 1802)

© Turner Art Co.

Cat and Kittens at Play, by Julius Adam
(German b. 1852)



Luxembourg

The Escaped Cow, by Julien Dupre
(French b. 1851)

Metropolitan Museum, New York

The Horse Fair, by Rosa Bonheur (French b. 1822)

Photograph by Soule Art Co., Boston

National Gallery, Berlin

One of the Seven, by Otto Gebler (German b. 1838)

National Gallery, London

Dignity and Impudence,
by Landseer

A big dog always seems to be "on his dignity" in the presence of a little dog!

Notice the swallow perched on the boy's hat, the morning sunshine streaming through the opening which you cannot see and the cracks in the door which you *can* see. How troubled and restless the sheep look! They are anxious to get out to their breakfast. (See SEVEN SLEEPERS.)

Land, Sky and Sea in Art

By Permission of Berlin Photograph Co., New York
The Crabfishers, by Bernardus Blommers
(Dutch b. 1845)

The Life Savers, by Georges Haquette
(French b. 1850)

Avenue of Trees, by Hobbema
(Dutch b. 1638)

Landscape Study, by Claude
(French b. 1600)

COMPARE the great variety in this page group—the quiet waters in which the Crabfishers are working, the stormy sea, the quiet Dutch landscape, the desert scene and the bold cliff by Claude.

The Two Majesties, by J. L. Gerome
(French b. 1600)

truth, neither one is devoid of truth. 'Science is the knowing; art is the doing."

The scientist, we have said, measures, compares, expresses things in terms of each other, establishes the relations of things one to another. In answer to your question: "What is a wave?" he will tell you that a wave is the result of certain causes and principles; he will show you the materials that compose the wave; and, if your curiosity is still unappeased, he will separate those materials into their elements. He will show you the effects of conditions upon them, and he may continue, showing cause and cause of cause to the beginning of the world; or, in the other direction, he may deal with effect upon effect to the end of it. He always leads you into the relations of the wave to all other things and always *away from the wave itself*.

The artist on the other hand forces your attention *to the wave*, ignoring in his picture the fact that anything else exists. "The real work of art — its way leads nowhere and its frame ends the world." (Münsterberg). He bends all lines of attention *to* the thing in hand, fills the consciousness with it, excluding all other things, and uses it as a means of bringing you into the mood which he has experienced. Sleep is said to be the most agreeable experience of which we can know. It relieves us, for the time being, from all responsibility and the need of making any sort of choice or discrimination. Fine art brings us into a somewhat similar condition of repose or of absorption. It leads us, as it were, by making captive first our sense of seeing or of hearing or our imagination, and thence, through the unity and intensity of its interest, our whole consciousness, until like the children of Hamelin we forget all else and follow. But our enjoyment of fine art differs from our enjoyment of sleep. The enjoyment of fine art is the enjoyment of repose, it is true, but even in this repose there are a sort of activity and a full consciousness. When we are enjoying a lyric or a musical rhapsody or a symphony of color, we are living as intensely as at any other time, but our life is being led, and is simply free of the conscious effort of living.

The scope of this essay is to make clear the nature of fine art. It is not its purpose, however, to rehearse any justification of it. Fine art, it is true, does not appear to minister to any of the primal needs of food, raiment or shelter. We cannot here discuss the question as to whether or not man has any real needs other than these three, which, to be sure, he shares with all the higher animals. True it is, however, that the oldest relics of man's handiwork that have come down to us are examples of his fine art, and true it is that he has never ceased to paint and sing nor to admire and listen even to this day. GEORGE WILLIAM EGGERS.

Fine Arts, History of. A complete history of the fine arts, under which head we must include such forms of expression as architecture, sculpture, painting and decoration and the handicrafts, would at the same time be a history of the development of the esthetic, intellectual and religious nature of the human race. It would need to be considered in its relation to its primitive development, its climax and its decline.

Certain typical phases belong to the art of all races and individuals, and it is only these typical phases that can be clearly demonstrated in special cases that will be touched upon in the brief treatment that is necessary here.

It seems to be true the world around that pictorial expression was first of all a means of communication and was, as nearly as possible, representative of the object depicted. Gradually the truth to the object's form was replaced by some character that became the sign of the object. From these developed the characters that, finally, were used in the various alphabets. In the childhood of the race the tendency is to interpret natural phenomena in the terms of personal experience; and we find records of this personification and symbolism in both the construction and decoration of articles used in religious ceremonials and in the things of every day utility.

At first what seems to be decoration is not such in a strict meaning of the term, but is rather significant of a religious thought or is propitiatory in character.

Art in its strictest sense can only be said to begin when there is a distinct reaching out for the expression of beauty in the form of the thing created and when there is added to this endeavor the effort to make the form more beautiful by means of a suitable decoration. Symbolic use of decorative forms frequently precedes, by many generations, the studied effort so to use them that they are subordinated to the object, and frequently we find decorative forms, in the later phases of art, that have completely lost their significance.

In the decadent period of all arts we have finally lost both the symbolism of decoration and art-forms and the sense of its fitness, and find in their places a scarcity of originality and a realistic and frequently over-ornate use of natural forms. Any art that resorts to copying other forms, or to the copying of natural form for the sake of skillfully imitating it, has lost its inspiration and is in its decadence. At the present time we have, in the various countries of the world and among the bar-

barous and semibarbarous races, art in all its stages of development.

ORIENTAL ART.

Japanese Pottery. Probably there is no other place in the world where art is so much lived and lived with as in Japan. Every article of religious, military, domestic or personal use is produced with a special view to its being beautiful, not only in workmanship, but in its design and its adaptability to its use, by a class of artisans whose craft has descended through many generations. and thus represents an accumulated skill that is quite impossible under the factory-conditions which force each workman to execute only a part of the product. Things do not go out of style in Japan. The few things that are necessary are chosen with the utmost care, and, being hand-made and well-made, last a long time. The Japanese excel as metal-workers, enamelers, lacquerers, wood-workers, textile-makers, printers and potters. As space is so limited, the last named craft is the only one which will be treated here.

Japanese pottery is distinguished for refinement of form, varied and wonderfully executed design and unparalleled range of color. The most famous potteries are those of Arita, Kyoto, Kaga, Satsuma and Awari. Satsuma and Arita have produced both pottery and stoneware that compare favorably with anything of the kind that has been made anywhere in the world. The rudiments of this art as of many others were learned in China, and the Chinese influence is frequently traceable in the design. Japan is richly endowed by nature with all the materials in the form of clays and minerals that are used in the making of pottery and its colors, both of which they have used in bewildering variety.

In the 13th and 14th centuries there was a preference for the iridescent black, red, brown and dark-green of the Raku ware, but late in the 16th century, when the tea-ceremony became popular, taste in the matter of pottery underwent a marked change. Ninsei founded the kilns that produced the Awata, Kiomidzu and Omura wares. Ninsei was very skilled in the use of the brush, and decorated his wares with birds, flowers and human figures in creamy blue, light green and coral glazes. Kenzan and Yeiraku were famous potters who worked during the latter part of the 17th and the early part of the 18th century. Both were great colorists, but somewhat neglected form.

Japanese pottery can best be identified by its color. A soft gray-green is characteristic of the kilns of Sanda Seiji; grays and salmon of Haji; yellow-brown of Oki; and drip-glazes of Oriba. Satsuma is the most popular of all. It is famous for its soft, creamy-white backgrounds that are like old ivory and for its soft colors and gold. The 19th century produced the Bizen ware that is remarkable for its wonderful metallic brown and blue glazes. At the present time the development of pottery is at a standstill, and many of the kilns are producing inferior articles for the foreign market. See Bower: *Japanese Pottery* and Hartmann: *Japanese Art.*

Japanese Painting and Sculpture. Sculpture and painting may be said to have had their beginning in Japan between the seventh and ninth centuries A. D. They were derived from China, as were the initial movements of all Japanese culture. The earlier phases both of painting and sculpture show, very distinctly, an Indian influence, and this is explained by the fact that Japanese art had its inspiration in the introduction of Buddhism that came into Japan from India through China and Korea. The native religion was Shintoism which is little more than a system of ancestor-worship. Its sacred colors were red and white, and its temples were extremely simple in construction, with no decoration worthy the name, and contained little else than the sacred mirror. Hence this form of worship offered few inducements for the development either of an architecture or design. Buddhism, on the other hand, had a well-developed ritual and an organized priesthood, and was rich in its system of symbolism of form and color.

We find that sculpture, except as it is used in decorative wood-carving, was not a natural means of expression, and it was soon abandoned in favor of a form of art that could be expressed with the writing-brush. Sculpture, therefore, must be placed early in the history of this art. It is restricted, almost entirely, to huge bronze statues of Buddha, prominent among which are the Buddhas of Nara and Kamakura, the latter of which is a seated figure nearly fifty feet high. It was completed in 1252, while the former was finished in 750. Besides these and other colossal bronzes there are many gigantic wooden temple-statues of Buddha and other gods and goddesses. This sculpture is frequently very vigorous in treatment, and emphasizes spirit rather than form. The sculptured decoration of the temples and temple-furnishings is lavish in its design as well as in its use of symbols and color.

The painting of Japan may be classified into seven distinct movements, namely, the Buddhistic from the ninth to the twelfth centuries; the Yamato-Tosa from the tenth to the fourteenth century; the Sesshiu from 1421 to 1507; the Kano from 1400 to 1750; the Okio or Shijo from about 1750 to the present period; and the Ukioye from about 1640 to the present time. The last-named school, which produced the color-

print, will be treated in an article by itself.

The Buddhistic school produced most of the sculpture of Japan and represents the first attempt at painting. It was exclusively ecclesiastical in character, and was strongly influenced in spirit, treatment and color both by India and China. Its greatest artists were Kanaoka and Hirotaka, both of whom painted temple and palace-decorations. Its colors were rich blues, reds, greens and gold.

The Yamato-Tosa school, though classed as one, was in reality two different movements, the first of which was distinctly Chinese in its origin, while the latter was thoroughly Japanese. Most of its great paintings depict various phases of Japanese feudalism, the life of the court and of the soldier. The paintings of this school and those of the others, too, are almost incomprehensible to the foreigner. The western painter tells what he has to say in such a way that the scene, person or thing represented almost lives before our eyes, their form is so accurately painted. The oriental artist, on the contrary, is not trying to paint things realistically, but is trying to make us feel his poetic emotion by painting the merest suggestion of the form with the most beautiful lines and color at his command. He does not attempt, for instance, to imitate a cherry-blossom that he has plucked from the tree and brought into his studio as a model, but rather the life and spirit of all cherry-blossoms that he has gathered through all his life of loving observation; and so he paints what he considers the life and spirit of the landscapes, human figure and other things.

We frequently find in reproductions of the paintings of this school, the originals being very rare, the artist painting in such a way that the observer feels himself to be looking from a point above the scene; and where houses are shown, the roofs are left off, so that one looks down into the interior as well as seeing the outside at the same time. Many of the later artists of this school are represented by exquisitely dainty and idealized drawings of flowers, birds and other natural forms.

Among the prominent individuals of the Yamato-Tosa group are those of the members of the Minamoto and Mitsumoto families; and, later, Nobuzane, a great colorist, Mitsunobu, Mitsuoki and Mitsuyoshi. Tosan color was a new development, quite independent of that of the Buddhistic school. The predominating hues were gold, white, red, green, yellow and blue, which were used intensely strong, but so broken up and woven together that the result was not glaring but a rich, softened gray.

The next two schools were nearly contemporary, and their inspiration was Chinese. They were the Kano and Sesshiu schools, the former of which was founded by Chc Densu who tried to paint in the style of the Buddhistic artists; his successors, however, abandoned this idea and established a new style which was based on the brush line drawing of China. These men were great designers, and worked for many years in black and white exclusively, but later added color in imitation of the Tosa school. The masters of this school excel in technique of the brush as well as in design. They painted panels in which, as themes, they used animals, birds, fish, flowers and trees. Its great masters were Kano Motonobu, Kano Massanobu, Tanyu, Yeitoku and Korin, who is sometimes accounted the founder of an independent school. Korin was a master designer, lacquerer and colorist. Sesshiu was the founder of the school that bears his name. He studied in China, and he and his followers had ideals, and used a technique and subjects, that were similar to those of the Kano school.

The Okio or Shijo school, known as the naturalistic movement, was founded by Okio who aimed at realism in painting and dealt with such subjects as birds, fish, flowers, trees and landscapes. This realism was not the same as that of the western world, which always draws an individual thing in a given moment and light, but was rather a truth to nature that was the result of so thorough a knowledge of nature that it was possible to draw any of her forms without having the thing actually present as a model. Sosen, one of the artists associated with this naturalistic movement, was famous for his paintings of monkeys.

In later years the artists of Japan have been diverted from the development of their national ideals of art by an interest in the art of Europe and of America. There, however, are two men still living in Japan, who have endeavored to maintain in their own painting what is best in the ideals of Japanese art; they are Hashimato Gaho and Ogato Gekko, the former the chief professor in the Tokyo Academy of Fine Arts. See W. Anderson: *Pictorial Arts of Japan;* Lafcadio Hearn: *Glimpses of Unfamiliar Japan;* Sadakichi: *Japanese Art.*

Japanese Color-Prints. Although the Japanese have developed the process of color printing by means of engraved wood-blocks to a point of excellence beyond that attained by any other nation, they themselves do not class them as art, and their creators are considered nothing more than artisans. Perhaps this was because the painting and sculpture were under the direct patronage of the upper classes and dealt with subjects which touched only upon the ideals of culture which were a sealed book to the common people; and because the print-school from the very first sought to portray the life of the people and actors and other classes which were not

recognized by those of higher rank. In fact, they seem to have chosen such subjects as would be appreciated by those who had not the means to purchase the examples of higher art. These prints, some of which now are sold in Europe and America for several hundred dollars, cost only a few pennies in the streets of Tokio at the time they were printed. Aside from the wonderful technique, their marvelous design and harmonious color have been the source of inspiration to more than one western artist, among whom we may mention Whistler and Monet.

There were three persons who were concerned in the production of a Japanese print. They were the artist, the engraver and the printer. The artist drew the design on thin transparent paper in outline, indicating by notes what colors were to be used and where they were to be placed. These outline-drawings were then turned over to the engraver, who pasted them face-down on blocks of cherry-wood, which was always cut with the grain. With a very simple set of knives, chisels and gouges he cuts around these lines and chips out the wood between them, until only the lines of the artist's brush are left as high as the surface of the block. Several prints are made from this line-block on transparent paper, which in turn are pasted face-down on other pieces of wood, from which are engraved blocks for each color which is to be printed. These various blocks are then turned over to the printer, who mixes his vegetable color with a thick rice-paste, and applies it to the block. Without moving the block on which he has spread his colors, he applies a moistened piece of paper, which he pats down on the colored block until it has absorbed all the color. This process is repeated until all the colors indicated in the artist's sketch are printed.

Wood-block printing in black and white had been practiced in China for many centuries in the printing of the text and in the illustration of books, and it was in that way that it was first used in Japan. In the earlier stages of the art color-pictures were printed in outline and then colored by hand. Gradually the process became perfected, until it was possible to print most delicate and intricate designs and get any desired effect. The great works in Japanese color-printing were nearly all produced between about 1680 and 1850, since which time the art has been in its decline.

A few of the great print-artists in chronological order are Hishikawa Moronobu, Suzuki Harunobu, Katsukawa Shunsho, Torii Kiyonaga, Utamaro, Utagawa Toyokuni, Hokusai, Shunsen, Kunisada and Hiroshige. The most universal genius of them all, no doubt, was Hokusai, who at once was a painter, designer and print-artist. He, more than any of the other of these craftsmen, is recognized by his countrymen, who, however, never could quite forgive him for the vulgarity of the subjects he chose to paint. Hiroshige is famous for his landscapes. Excepting Hokusai, he was the only one of the print-artists who treated the landscape in any other way than as an accessory for their figures. See E. F. Strange: *Japanese Illustration* and William Anderson: *Japanese Wood-Engraving*.

Chinese Painting. Chinese pictorial art, when compared with that of Egypt, is modern, whereas in relation to Japanese painting it is quite ancient. There seems to be no trace of any native Chinese art of this kind previous to the time of the introduction of Buddhism into China, whither it came from India during the reign of Emperor Ming in 62 A. D. There are records, between that time and the seventh century, of paintings of dragons and of Buddhist gods and goddesses that were made for the decoration of temples. In the eighth century there were two famous painters who were employed to do some decorative work for the government. The Sung dynasty between 960 and 1206 had many painters, among whom were Li Lung-yen (or Ri-riu-min as the Japanese know him) and Ngan Hwui (or Ganku in Japanese). The former was famous for his Buddhist pictures, his drawings of landscapes, horses and the figure. He is represented in the British Museum by a painting called *The Nirvana of Sakyamuni.* The latter was known as the last of the great masters who so strongly influenced Japanese painting. The Yüen dynasty between 1206 and 1450 had some noted painters of horses, tigers and birds, the most famous of which perhaps, was Chao Meng-fu whom the Japanese call Cho-su-go. The Ming dynasty between 1450 and 1628, like the Yüen, shows almost an absence of religious paintings, but many landscapes, birds, flowers, animals and figures.

In China, painting was a direct outgrowth of writing. For centuries the greatest admiration was felt for the ability to write beautifully; and to write Chinese is to be able to control the brush to a degree that is impossible to an occidental. In learning to write, the Chinese learn to master the mechanical part of the painter's art, and it only remains for him to draw objects instead of the characters of writing.

The Chinese painter cares little about representing things as they look in the truth of light and shade, perspective, etc., but tested his work by the character, directness and vigor of the lines used. There were three ways of painting: by the use of line alone; by the use of line and mass in monochrome; and by the combination of line and color. The Chinese painted both on paper and on silk, on which they used either ink or an opaque

water-color of very durable quality. The Chinese painter applied his art to such crafts as wood-engraving, decoration of pottery, lacquer and embroidery.

While the painting and sculpture of China furnished the inspiration of those arts in Japan, they never reached the high state of development that they did in the latter country. Literature, to the Chinese, seems to be the more natural medium of aesthetic expression. See William Anderson: *Catalogue of Chinese and Japanese Pictorial Art.*

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EGYPTIAN ART

Egyptian Wall-Painting. Egyptian wall-painting is symbolical and decorative. Its first object was to tell the story of the king's life, public and domestic, his battles, triumphs, religious ceremonies and sacrifices and festivals. He was believed to be a relative of the gods, and therefore received devout tribute and praise from his loyal underlings. He made the laws, was the judge and declared war; in fact, everything was under his control.

Secondly, this painting was to decorate the wall-surface. It was always flat, never giving the effect of light and shade and never showing any perspective. The face of a human being was always painted in profile, while the shoulders were drawn in full front-view; and, again, the body was so twisted that the legs and feet were in profile. The feet and hands were always drawn flat. The drawing of the lower animals shows much more truth in portrayal. In most cases the artists caught the characteristic movements. In depicting landscapes the surface of their wall or paper was considered like a map, except that everything was drawn parallel to the picture-plane. Zigzag lines represented flat water, a tree a forest and a fortress a city. Flower-forms always were drawn generally and never in the particular (conventional as some may choose to term it), and used with great skill as decorative motives.

In composing, in order to make one figure the principal spot of interest, the artist drew it very much larger than all the rest. Hence we always find the kings like giants amongst pygmies when compared with their followers. The drawings were all made in outline and the enclosed spaces filled with bright color. The paintings were in most cases put upon the stone buildings, the pylons and the enclosing walls of the cities, temples, etc. Here the sculptor carved the outline in the stone, and then the color was applied to the drawing. The interiors of the tombs were always decorated in brilliant color, to brighten and enliven, and told the story of the deceased's domestic life. At first, in the painting, the story was merely told by the hieroglyphics with color painted into the cuts, but later these stories were illustrated with symbolic pictures and flat color, and later were drawn not only upon stone but on various materials, as the wooden lids of mummy-chests, papyrus, etc., with an outline of black chalk or coal; and finally the bounded space was filled with color mixed with gum-water. See, also, PYRAMIDS; TEMPLE OF LUXOR; TEMPLE OF KARNAK; SPHINX and RAMESSION.

ASSYRIAN ART

Architecture. Assyrian architecture is so closely allied with that of Chaldea or Babylonia that it is difficult to separate them. We might consider the two in one great style, as it is only by comparing the ruins of one with those of the other that we can make any headway in our study.

The Chaldeans in the valley of the Tigris and Euphrates, being overthrown by an invasion from the west in 1518 B. C., gave the Assyrians a chance to rise to supremacy and in 1273 B. C. they founded the great kingdom of Nineveh which held the ruling power for six and one half centuries in Asia.

The ruins of the buildings of these people are little more than undiscernible heaps of clay, except those found at Persepolis which are fairly well-preserved. Their almost complete destruction is due to the lack of any natural, durable material and to the lack of fuel which made fired brick very costly. Wood and stone had to be carried long distances, and therefore were very expensive and usually used only for ornamentation. Hence we find little refinement of form, no system of colonnades, no overhanging cornices or the like. Sun-dried bricks of clay, made of the viscous, adhesive soil, in blocks 12 x 12 x 2 or 4 inches were the most usual building-material. These bricks were often put into the building wet from the molds, and allowed to bake in the structure. Sometimes lime and mortar were used as adhesives, but usually only bitumen.

The most important and distinguishing feature of this early architecture of Assyria is the wagon-vault or tunnel-vault, a prolonged arch of sun-dried bricks, raised obliquely from the walls and used to roof long halls, rooms, sewers and drains. In the rooms at brief intervals there were higher vaults for the admitting of light and air, shaped like semidomes. Fire-brick was used as an inner facing in the drains.

Columns were not commonly used, though sometimes they are found constructed of brick or sections of sun-dried clay. Galleries raised on columns for the admitting of light have been discovered.

The most important buildings were palaces, hanging gardens and temples. No tombs have been discovered, unless it be

the pyramid of Nimrud, a massive structure without stairs or inclined plane, but nothing certain is known about its use.

The Assyrian structures were built upon terraces or in the form of terraces to which flights of steps or long, gradual slopes gave access. The walls were unbroken, except by towers where defense was necessary, and of uniform height. The temple terraces were of many colors according to their religious symbolism.

Sculpture. Assyrian sculpture was decorative and in most instances done in bas-relief. The artists show great freedom of method, but were bound to certain conventions by religion and royalty; hence there is little poetry in their work. The Assyrians seldom departed from incidents in their religion and in the life of their king. The sculptor was the historian and pictured the king, who is rarely seen alone, in his victories, triumphs and hunting trips In this sculptured history the king is shown leading the procession of warriors followed by the priests, judges, common people, horses, etc.

The sculptor uses one type of man throughout, the king being recognized only by his curled hair and beard, high tiara and costly attire. In the same way his followers are known by their dress.

Above the kings are the composite beings with human features, signifying intellect, and body and wings, types of brute-life, signifying power and strength. The most common of these creatures were the winged bulls, having human faces with curled hair and beards and wearing high tiaras topped by a crest of feathers. There were others, gods represented by combination of parts of various birds and animals, but nearly always having the faces of human beings. There also were evil spirits which were always hideous assemblages of the lower forms of life.

Sculpturing in the round was usually employed to represent the gods only, although in rare instances the king is so modeled, when he is walking alone.

The lower animals were always a source of inspiration to the Assyrian artist, who carved and chiseled them with a truth and precision that are surprising when we compare them with their study of the human figure.

Assyrian sculpture was done for the most part on slabs of soft alabaster and limestone, and was in nearly every case used for interior decoration. Sculpture in Assyria was cut short in its development by wars, so that no rise and decadence are shown, but rather a slow but steady progression.

Pottery. The Assyrians were well-advanced in the art of making pottery, as clay was their chief material for artistic expression. Brick-making may be classed under this head, (see ARCHITECTURE). The bricks were large, usually square and of two kinds, sun-dried and fire-baked, the former being used mostly for heavy building, while the latter usually were applied as decoration. These fire-baked bricks were frequently covered with brilliant colors and enameled with copper. Flowers, rosettes, palmettes, chain-patterns, subjects of the chase, men, animals and trees were painted into the enamels, and each brick bore the name of the king.

The literary productions of the land were inscribed upon bricks, tablets, vases, etc., and collected in large libraries. Many of these records are in existence to-day and fairly well-preserved. They are written in cuneiform, and contain valuable writings and accounts of the life of the people, verifying many of the stories of the Bible.

Few vases are found, except large urns that were commonly used for coffins.

Painting. Very little is known of the painting of Assyria, but traces of color have been found on the bas-reliefs, wall-decorations and terraces. In the latter each terrace was painted a different color, according to the phase of worship to which it was devoted. Pins of clay were pressed into the interior walls of buildings while they were still soft, forming interesting design-arrangements, and then colored in various schemes This shows that the art of painting was not entirely unknown, but the perfection that it attained can only be guessed at.

GREEK ART

Sculpture and Pottery. The period of primitive sculpture in Greece was previous to 1000 B. C. In the Mycenæan age the temple-decoration depended upon fresco-painting and incised cement floors, and there was very little sculpture. The gate of the citadel at Mycenæ (1500 B. C.) displays a relief of two lionesses with their forepaws resting upon an altar. Dignity and power are expressed in every line of their angular bodies, and one turns from the contemplation of the woolly manes and lashing tails of modern forms, to these simple, archaic beasts with keen delight. Mycenæan pottery was the leading lucrative form of modelling. It was so varied and attractive that desire for pottery was stimulated. When Athens and Corinth became rivals in this industry, Greek wares migrated all over Italy as well as the Orient. The Greek vase illustrates the history of the country a thousand years previous to an authentic written word. The designs were first marine and then geometric, and the colors lustrous reds, blacks and browns. Mythological subjects predominate, and the religious teaching of vase-pictures from the first to the last chapter of Greek theology is incalculable. The majority of vases were adapted to household needs such as the

amphoræ for storage; the hydria for drawing and carrying; the lekythos for pouring; and the kantharos for drinking. Primitive sculptures at Selinus interpret the Greek idea of strength in short legs, thick bodies and exaggerated muscles. A perpetual smirk, supposed to indicate joy, is found on the round faces with their bulging eyeballs and spiral twists of hair.

The transitional period is illuminated by such productions as Myron's *Discobolus* and the pediments at Olympia. The *Discobolus* is a bronze of a young Greek throwing the disc. In the face and form we have the generalized type of masculine beauty and grace which had reached its height at that period. The art of Myron was not obscured by that of Pheidias, for the sequence of productions in Greece flows on like a splendid river, where each bend or turn lends a charm all its own.

The architectural feature of the age of Pheidias was the Parthenon, the Doric temple of Athene, the patron goddess of Athens, as well as the treasury of Athens. It was the background for the most important group of sculpture the world has known.

The Panathenaic (all-Athens) procession was a celebration of civic pride, combined with religious sentiment. Therefore, it was logical that Pheidias should choose the subject of this procession for the magnificent sculptured frieze within the portico. The exquisite grace of the maidens who lead the van, the spirited steeds and athletic figures of the young men, the whole play and movement of this wonderful presentation in marble are indescribable. The remnants of the frieze and fragments of two splendid pediments are housed in the British Museum, but only a supposed model, combined with historic descriptions, suggests the beauty and grandeur of a statue once within the building.

This figure of Athene was thirty-nine feet in height and of wood and stucco. The flesh-parts were covered with ivory, with eyes of painted marble to imitate nature. The hair and draperies were of solid plates of gold, so made as to be removable in case of war and yet leave the figure uninjured. It is said that eight statues of Athene were executed by Pheidias, as well as the colossal figure of Zeus at Olympia.

Writers declare that in this last work the sculptor reached the climax of portraying divine excellence, serenity and joy. The ruling power with Pheidias was the ideal; with Polykleitos the sublimest beauty is the real, but in Praxiteles we find the sculptor of gods, not men.

In a room at Olympia, especially designed for its occupancy, stands the *Hermes* of Praxiteles, the most beautiful of marbles. The smile of the mobile mouth is as gentle, the curling locks as crisp, as when the master sculptor gave the last touch to that serene brow. To see it is to know that the essence of divinity has manifested itself in a materialized thought.

The important sculptures of the Hellenistic period were the figurines in terra-cotta found at Tanagra and three statues in marble. These three matchless works are the *Apollo Belvedere* in the Vatican; the *Venus of Melos;* and the *Victory of Samothrace* in the Louvre. The last is the most interesting of all, for, headless and armless though she is and though poised at the top of a flight of stairs instead of upon the prow of a ship, she seems to rush onward, her vibrant wings spread to meet a fresh sea-breeze. See A. S. Murray: *History of Greek Sculpture;* F. B. Tarbell: *History of Greek Art;* and J. H. Huddilston: *Greek Pottery.*

Gothic Architecture and Sculpture. Greek temples are beautiful without, Moorish mosques within, but the Gothic building is beautiful both within and without. It stands as an expression of the freedom of thought between feudalism and the crusades. It was the result of the brotherhood of Masons, who, together with the clerical authorities, desired to build royal monuments to the living and ever-present God. Because of this the great Gothic cathedrals have eternal youth. "Gothic implies a building in which stone vaults are supported by a framework of independent ribs." This skeleton is supported vertically by heavy piers, and the combination is prevented from falling in or out by thrusts in the shape of arches and buttresses, that distribute the weight of the vaults and ribs.

Walls proper scarcely exist, because the usual wall-space is occupied by enormous windows above the ground-story of the exterior and within by colonnades. Huge outer abutments are the bases for what are called the flying buttresses. These are a form of arch which rests at one end on an outer pier, while the other presses against the upper or clerestory. The flying buttress, the skeleton-framework and the prolific use of the vertical line are the characteristic features of Gothic art. Among the most important examples are the French cathedrals of Chartres, Amiens, Beauvais, Rheims and Notre Dame de Paris; the English cathedrals of Lincoln, York, Winchester and Canterbury; the German cathedrals of Cologne and Strassburg; and the Italian Duomo at Milan.

The notable feature of the perfected Gothic, which is found in France, is its adherence to fixed structural laws. In the other countries features have been added that are neither useful nor more beautiful than the French plan, but lend a local touch to the edifice.

The square east end of the building and the lancet, decorated and perpendicular styles

of windows are peculiarities of English Gothic. Moreover, some of the churches have timber-ceilings instead of stone-vaults. Another innovation is called stellar vaulting, when the ribs are so numerous and so arranged as to form a star.

It is said that the towers of Chartres, the nave of Amiens, the choir of Beauvais and the doors of Rheims would make a perfect building.

Gothic sculptures are at their best in France, where unity of style is essential. Not only are the sculptures plastic histories, but the manner of handling the figures corresponds with the adjacent lines, angles and curves of the building on which they are placed. Thus the realistic gives place to the harmonic. The lines on the male figures are often so elongated, in order to express dignity and to harmonize with the surrounding, as to lose in beauty when judged as a single work of art; but, as only a unit in the whole building and seen from a little distance, the perfection of taste displayed is obvious.

The typical motive in English and German decoration is the leaf-form. This grew from the trefoil or three-lobed grape-leaf (emblem of Christ) to naturalistic copies of oak, maple, lettuce, carrot-leaves and fruit. Leaves in flame-shapes to correspond with the flamboyant style in building were found on English structures, and nothing could be more charming than the foliage carved in the stone of Strassburg.

Gothic design prevails in all European wood-carving as well as in the productions of metal-workers. Grotesque sculpture, as expressed in the gargoyles (rain-spouts) of cathedrals and in freakish heads of men and beasts, as illustrated in the numbers that fairly ripple over the walls of Rheims, are to be taken seriously when their symbolic meaning is understood, for they are supposed to represent the various forms adopted by the Satanic horde when expelled from the sacred precinct by the heavenly host. See *Cathedral Cities of France* by H. M. Marshall; *The Cathedrals of England* by F. F. Bumpus; *Gothic Architecture* by Francis Bond; and *Great Cathedrals* by E. A. Brown.

Byzantine Art

Architecture, Sculpture and Painting. Byzantine architecture which is sometimes called eastern Romanesque, like the western Romanesque was a further development of the older Roman style. The geographical position of Byzantium, being the same as that of the modern city of Constantinople, made commercial communication with the east both natural and easy, and this was the means of bringing the art and culture of the orient to the notice of the western world and the reason that we find in Byzantine architecture the fusion of the structural and decorative characteristics of both Rome and Asia Minor and the far east. From Rome the Byzantines borrowed the use of heavy buttressing, either on the inside or the outside of buildings, the use of monolithic columns and the incrustation of walls and piers with panels of marble and rich decoration of mosaic. From the east they obtained the idea of their vaulting and the style and treatment of their design.

The most characteristic feature of Byzantine building is the prevalent use of the dome and the construction of the dome on what are known as pendentives, which made it possible to surmount a building having a square ground plan, with a circular dome.

This may be more easily understood, if we can imagine a large hemisphere resting on four piers or vertical supports, then supposing that four vertical sections, in the same plane with the sides of the square made by the four piers, are cut in the hemisphere, leaving four semicircular arches, one spanning each pair of piers. Then we may imagine a horizontal section cut from the top of the hemisphere, leaving triangular sections of a sphere between the four arches and the horizontal section, which are the pendentives. Sometimes a hemispherical dome rested directly upon this horizontal opening but in later buildings a cylindric crown was built around it, in which windows were made, and on this crown was placed the final dome.

Byzantine buildings were almost exclusively ecclesiastical in character, and made use of a wide variety of ground-plan, such as the circular, octagonal, Greek cross and oblong.

The exterior of the buildings was severely plain, having only bands of a lighter or darker marble to mark the stories of the structure, but the interiors were very rich in colored decoration in painting and mosaic as well as in sculptured design. The painted decoration was used in the smaller buildings, while in the larger ones is found most gorgeous embellishment of mosaic in the richest of color and gold, in which were depicted biblical scenes, saints and symbolic figures. Set patterns, monograms, crosses and other symbolic geometric forms were also wrought with great beauty. As early as the 5th and 6th centuries the Byzantines had developed a beautiful and individual style of sculptured decoration, which was usually in very low relief and gave a lacelike and charming effect to surfaces. The acanthus and anthemion were the most common forms used in carved decoration, but they were treated in a new and individual way.

The greatest monument of Byzantine architecture and one of the masterpieces of building of the world is the Hagia Sophia,

which was originally a Christian church built in 532 A. D. by Justinian, but which is now a Mohammedan mosque in Constantinople. In Constantinople, also, is located St. Sergius, another example of Byzantine architecture. This building, like San Vitale in Ravenna, has an octagonal ground-plan and is surmounted with a dome.

Byzantine art spread its influence far and wide and until the 12th century and, in some places, until much later, it dominated the art of the Christian world. In Venice is an example of this influence in St. Mark's. In Russia, where we find the fantastic bulbous dome, and in Greece the Byzantine style of building has remained the approved style of the Greek Catholic church. There are buildings of this type in Greece, on Mt. Athos and in Athens. Probably the most marked influence it has exerted is on Mohammedan architecture even to the present time. See *Hamlin's History of Architecture*.

Italian Art

In Italy have arisen and developed three successive styles of architecture, namely, the Roman, the Byzantine and the western Romanesque. Each of these has produced its own distinct type of decorative painting and sculpture. We have treated Byzantine art under a separate head. Italian painting and sculpture, which belong more particularly to the last named style of architecture, will be dealt with in detail in the biographies of the artists of the renaissance, which is said to begin with the work of Cimabue, who is called "the father of modern painting," in the 13th century.

Cimabue and especially his pupil and successor, Giotto, tried to break away from the traditions of the church that had fettered the Byzantine painters and sculptors; and they gradually grew toward a representation of the human figure that had grace and beauty as well as more truth of drawing.

There were two great centers of culture and art that produced the majority and the greatest of the Italian masters. These centers were Florence and Venice. The Florentine school comprised such artists as Cimabue, Giotto, Masaccio, Fra Angelico, Botticelli, Raphael, Lionardo da Vinci and Michael Angelo. The Venetian school claims the two Bellini, Titian, Veronese and Tintoretto. Montegna came from Padua, Corregio from Parma, and Perugino with a group of students makes up the Umbrian school.

Venetian Architecture. Situated halfway between the Byzantine and Franconian empires, Venice became the market-city of exchange between two powers. Artists from the east and west were drawn to this great bazaar and native workers accompanied the ships that pillaged oriental cities of materials and ideas. The Venetian artisan was clever enough to learn the secrets of many trades, and imitated them,—to the gain of decorative Venice. The architects and builders had not the severe and practical training of the Pisan and Florentine. There was no internal warfare in the republic, and therefore no need of household fortresses. Therefore the Venetian seized upon the picturesque and fantastic styles in others, and grafted them upon a building suited to his needs. For instance: Venetian palaces face canals; some on cross-intersections of waterways: therefore angle-windows were introduced, that the owner might have two views. These were faulty in construction,—but how convenient! The useless screen over *Ponte del Paradiso* would be ridiculous, if it were not a gem of the sculptor's chisel. A lack of coherence is one of the marked demerits in Venetian building, although that is balanced by a keen sense of the picturesque.

Among the most important examples are the Byzantine cathedral of St. Mark; the Gothic palace of the doges; and the renaissance church of S. Maria dei Miracoli, where the evolution in type of construction is seen. St. Mark's, Venice, with its oriental columns, its sculptures, bronzes and mosaics, is a museum as well as a church, for here are found the spoils of battle as well as the symbols of peace. The mosaics are set to show a tiny rim of plaster; this opaque rim of white, combined with the bits of gold and colored glass, produces a glow upon the walls that is matchless.

The two lower arcades of the doges' palace are among the best in Europe, but the building is badly marred, because the third story, planned to rest on the back of the upper arcade, was brought forward flush with its front edge. The marble facing, however, of this despised third story is built into the wall, instead of being stuck on, as was usual elsewhere. The sixteenth-century library, built by Sansovino, with its double colonnade of open arches and embedded columns, is one of the finest secular buildings in Europe.

This edifice, with the cathedral and the ducal palace, forms a noble group about that heart of Venice, the Square of St. Mark. From the water-gate of this square Palladio's Campanile of San Giorgio cleaves the sky and is a bright foil to the great dome of S. Maria della Salute.

We embark and glide down the Grand Canal, with "glorified streets" in the form of bridges and lined with old palaces, showing the same fine distinction of style in Gothic or Renaissance, as their owners in family and position, and then the eye falls on one of consummate grace; so satisfying is it to a lover of pure beauty, that one knows instinctively that he looks upon

Casa d'Oro, the Golden House of Venice. See *Stones of Venice* by John Ruskin; *Venice* by Molmenti; and *Venice* by F. Hopkinson Smith.

German Art. Romanism ploughed its way across Germany at an early period, with the result that by the tenth century a large number of wealthy monastic buildings were established on or near the Rhine and Danube Rivers. However, no churches of great importance were erected before the eleventh century, excepting the octagon of Charlemagne at Aix-la-Chapelle and the Romanesque cathedral at Bamberg. The monks in the aforesaid monasteries painted exquisitely on parchment, and produced some interesting pottery and glassware. It was not until late in the thirteenth century that Gothic art in its perfected form appeared, and culminated in Cologne cathedral. The Saxon city of Dresden was the cradle of Rococo art with the Zwinger building as an illustration of this period in its most exaggerated or baroque style. By way of the Meissen potteries, in the neighborhood of Dresden, the rococo garlands and scrolls, as painted on china, migrated from country to country and became a familiar and popular type of decoration. Berlin is the center of huge government and private palaces where the work of the distinguished architect Schinkel has been enthroned. Yet neither city could command the same unqualified approval from art-critics in general as the old town of Nuremberg, with its lofty dwellings peppered with quaint gable-windows, and the possession of that group of men known as the Little Masters.

To understand German stonecutting, one should study the carvings on the church of St. Sebaldus, Nuremberg, executed in the fifteenth century by Adam Krafft. To appreciate something of the endless and minute labor expended upon a single monument, days should be spent in examining the bronze shrine of the saint within the church, the work of Peter Vischer and his five sons, who were thirteen years modelling it. A crucifix and several large reliefs in the choir by Veit Stoss exhibit master-carving in wood, which is one of the leading German crafts. The greatest of German artists, of the Nuremberg masters, was Albrecht Dürer (1471–1528) painter, engraver and goldsmith, whose nobility of character and versatility of talent place him on a pedestal of fame that will never topple over. The two Holbeins rank next in importance to Dürer; Hans Holbein, court-painter to Henry VIII, was a strong technician and a fertile inventor. His pictures of home-life are charming and versatile.

Among the modern masters of Germany are Schwanthaler (sculptor) and Cornelius, Overbeck, Von Kaulbach and Richter (painters), who were the proteges of kings and the idols of the people. The heroic bronze figure of Bavaria by Schwanthaler is a metal epic that dominates Munich, now the art-center of the empire. Cornelius and Von Kaulbach have executed important modern wall-decorations, and Overbeck's group of large engravings of the *Life of Christ* is a national treasure. No pictures of children's faces are purer or sweeter than the lovely composition known as the *Song on Christmas-Eve* by Ludwig Richter. A new school called the Sessionists has sprung into being and met support, and Franz Stück has been the leading spirit. See *History of Art* by Lübke; *Gems of Modern German Art* by Scott; *Northern and Southern Germany* by Baedeker.

Russian Art

The churches of Russia, as well as some of the palaces, are stamped with Byzantine design, mingled with an exuberant local feeling that is barbarous, without being effective from a truly artistic viewpoint. At a distance the numerous highly colored and gilded cupolas, domes, spires and other bulbous projections, which are heaped upon one building, lend it the form of a vegetable bouquet. However, taken singly, nearly every one of the turnip, carrot or onion-shaped domes or towers, with its gilded or colored surface, is intensely interesting. There is a general disposition to build the central dome or tower unbroken from within, so that the wall-paintings of enormous figures may be carried up the funnel-shaped openings from above the congregation to the top. A succession of granite steps leads to the pompous portals, thus adding to the grandeur and solemnity desired by the builders. High, dark arches gleaming with antique gold spread like bats' wings above the many shrines which are spangled by ever-burning lamps. A huge iconastos or screen, composed of holy pictures, separates the congregation from the priests who may be seen officiating at the altars through doors in this screen. Innumerable icons are hung about the church with racks for candles. These sacred pictures are modeled after the ancient icons painted by Rublof, a monk of the fourteenth century. The pinched, wan faces are supposed to inculcate habits of piety and temperance. The faces and hands are painted, and the hair and clothing are composed of etched metal-plates. Every room in every building, from the palace to the tavern, has its icon, which is placed in a corner directly beneath the ceiling.

The most interesting examples of architecture in Russia are the buildings included in the Kremlin or Citadel of Moscow, the cathedral of St. Isaac and the Peterhof at Petrograd and St. Sophie at Kief. The royal palace of Peterhof is situated on a hill which is a cascade of buildings, trees,

fountains and flowers. Peterhof is a weak imitation of Versailles, and everything that could be gilded glitters and sparkles with the brightest of gold. Russia boasts one of the finest collections of art-works, installed in the Hermitage, and her painters are prominent exhibitors at the various salons of the world.

Among the notables are Répine, Aivazovski, Siemiradski, Makovski, Volkoff, Peroff and Verestchagin. Everyone who attended the Columbian Exposition will remember the *Russian Wedding-Feast* by Makovski, and Vasili Verestchagin's great battle-scenes are familiar to many Americans. No painter has accomplished so much to tear the veil of glamour from the awful face of war as this apostle of peace. We understand something of the dense forests, wide marshes and desolate coasts of this distant country, when we stand before the canvases of Volkoff, and we appreciate more the mingled pride and cruelty of the early rulers when studying Répine's marvelous rendering of that last scene between Ivan the Terrible and his son. See *The Tsar and his People* by Eugène de Vogüé; *Russian Art* by Alfred Maskell; *Studies in Russia* by J. C. Hare; and *Russian Art* by Viollet-le-Duc.

Scandinavian Art

Northern Europe is noted for its love of rugged outlines and bold, pure color. These traits are manifested in Norway and Sweden, where cliff and precipice reign permanently and the skies change from clear bright blue to stormy black. Denmark is a charming foil; here all is gentle and undulating, and the predominating color is a misty gray. Norway contains a number of very old timber-churches with lean-to roofs above building and porch and but four small windows. The interiors are lighted by lamps which give additional warmth. The houses of the nobility in Norway and Sweden are composed of huge timbers with plastered walls, which are painted in many colors. The elaborate dadoes and doors of the Crown-Prince's palace at Stockholm are typical of the national spirit in decoration. In Westgötland, Sweden, there is a castle where the arms of the family, accompanied by huge scrolls, are arranged about the main portal like a pyramid. The scroll and the dragon design are the two principal motives in Scandinavia, and are turned and twisted in every conceivable way. Inlaid wood is one of the arts, and may be seen at its best in some exquisite panels in the palace at Kalmar. The wainscoting of the Golden Hall in this huge quadrangular edifice is worth much to the student of design. Baroque architecture seems to have reached its height in Denmark, where dropsical figures are arranged about the doors and windows or sport as goddesses on ceiling-decorations. Bertel Thorwaldsen, whose grave is found in the court of the massive building where his sculptures are exhibited, was the leading sculptor of the nineteenth century. His love of Greek art gave his work a repose which had been entirely lost in the exaggerated style of the Rococo.

Danish painting is homely and precise, as one sees it in the productions of Eckersberg, in Vermehren's charming cottage homes, in Viggo Johansen's captured moments of real life. The historical painter, Christian Zahrtmann, searches for spiritual feeling and expression, and Kröyer paints the wooded coasts in soft bluish-grays indescribably Danish.

Since 1860, in Norway, great interest has been manifested in the promotion of a national art, and the typical men who paint in a rough, angular but healthy and frank manner have made themselves felt. We hear most of Wenzel Jörgensen, Kolstoe and Krohg, painters of fisher-folk, and of Fritz Thaulow, whose glitter of ice and snow and little red houses at Christiania are so delightfully familiar and homelike.

Swedish artists are the Frenchmen of the North. They paint with grace and spirit. Stockholm possesses several historical canvases by Roslin, who lived in Paris in princely style. The Swedish painter of painters is F. J. Hoeckert. The museum of Lille owns his masterpiece, *Divine Service in Lapland*. The ultra-modern Anders Zorn, who has painted many portraits of distinguished Americans, is best known here. His manner of handling the brush is independent and bold, and his perception of character and temperament is as keen as discreet. See *Dictionary of Architecture* by Russell Sturgis; *History of Modern Painting* by Müther; and *Norway, Sweden and Denmark* by Baedeker. A. S. Hall.

See, as representatives of French art, Millet, Corot, Meissonier and others; of Dutch art, Van Dyck, Rubens, Rembrandt; of English art, Hogarth, Gainsborough, Turner, Millais and others; of American art, Innes, Hunt, Whistler, Lafarge, Saint Gaudens and others.

Fin'gal's Cave, a cave or grotto on the island of Staffa, on the west coast of Scotland. It is probably named after Fingal, the Gaelic hero. The cave is 227 feet long and 42 feet broad at the entrance, and can be entered by small boats, the sea being 20 feet deep at low water in the cavern. It looks somewhat like a Gothic church, with its tall pillars and stalactites of many colors, and is one of the most picturesque grottoes known.

Fin'land (Swampyland or land of the Fens), was formerly a Grand Duchy of Russia but declared its independence following the Russian Revolution of 1917, as did the inhabitants of other vast areas of the former

Empire, including Lithuania and Ukrania. Its population is about 2,900,000.

The area of Finland is nearly 145,000 square miles, or rather larger than Great Britain and Ireland.

Surface. The country abounds in lakes, about a quarter of it being occupied by lakes or marshes, the largest being Lakes Ladoga, Saima, Enara, Kemi, Ulea and Päyänne. Lake Saima has an outlet into Lake Ladoga over the famous Imatra Falls, the finest in Europe, and is connected with the Gulf of Finland by a canal 36 miles long, which is considered a triumph of engineering skill, running through granite rock. Finland has no large mountains and only small rivers.

Natural Resources. Neither fossils nor coal are found, but there are remarkably fine quarries of granite and a large area of forest land. These give employment to over 21,000 timbermen and lumbermen. Of wild animals, there are bears, wolves, foxes, otters, hares and ermines; seals are plentiful along the coast; and reindeer thrive in the far north. Of birds there are 211 species, and in the rivers, lakes and seas are 80 known kinds of fish, including the salmon, trout, perch and pike.

Climate and Agriculture. The climate is severe in winter, 25° below zero frequently being registered; and the summer, though very short, is hot. Apples, pears and cherries are found below latitude 63°, and currants, raspberries and strawberries thrive everywhere. Of cereals, rye is the most known, then barley, oats and wheat.

Exports and Manufactures. Its chief exports embrace timber, paper, cardboard, leather, hides, tar, pitch, iron and iron products. Her manufactures give employment to over 100,000 workmen and yield an aggregate product (exclusive of four mills) of the value of 351,000,000 marks (about $71,000,000).

Government and Education. The country was formerly governed by the Czar as Grand Duke of Finland. There was a senate, nominated by the crown, presided over by a governor-general, which sat at the capital, Helsingfors (population, with Sveaborg, 147,369), and was the chief administrative body. Education is in a highly advanced state, no less than 91 per cent of the adult population being educated. There is a university with 1,092 students. The country is divided into 16 electoral districts. There are 2,012 miles of railroads, almost all belonging to the state. The army consists of 5,400 men in time of peace and about 20,000 reserves. There is only a commercial navy, numbering 357 steamers of 54,556 gross tons, and 2,536 sailing-vessels of 297,758 gross tons burden. The financial condition of the country is good, its public debt being more than offset by the value of the state property.

History. The people of Finland, called Finns, are related to the Laplanders and to the Magyars of Hungary, and are entirely different from the Swedes and Russians. They are mostly of native Finnish descent, intermingled with the Scandinavian races. They are an industrious and honest people, though not very intellectual; tall and well-proportioned, with rather square faces, and belong to the agricultural class. In early times they were known as pirates, and formed an independent empire. Their attacks on sea-vessels so annoyed other nations that the Swedes undertook a crusade against them in the 12th century, conquered them, and converted them to Christianity. Sweden kept possession of Finland until 1809, when it was conquered by Russia. Under Russian rule Finland rapidly became Russianized, and that in violation of the state constitution. In 1900 the Russian language became the sole official one; while Russia then insisted on legislating in Finland, in defiance of the local *diet*, in all matters affecting Russian interest. As a result there was much disturbance in the country, with several notable assassinations of Russian high officials, besides considerable emigration from it.

Finland, Gulf of, the eastern arm of the Baltic Sea. It receives the waters of the great lakes, Onega and Ladoga. Navigation is dangerous, on account of numerous islands and shoals.

Finns. See FINLAND.

Fir, a name applied to the true pines, larches and other small evergreens, more properly used to denominate the Norway spruce, the silver fir and their kind. There are about 12 species of the Norway spruce and about 25 or 30 of the silver fir. They are all evergreen-trees. The finest of European firs is the Norway spruce, which attains a height of from 80 to 150 feet. It yields resin, turpentine, tar and lampblack. In Sweden and Norway the inner bark is made into baskets, and the long, slender roots, after being boiled with alkali and sea-salt, are twisted into ropes. The wood is known in the market as the white Christiania deal and the Dantsic deal. Other well-known varieties are the black spruce, white spruce, red spruce and oriental fir. The hemlock spruce of North America is also well known. Its wood is not much prized, but the bark is valued for tanning. The Douglas fir attains a height of 250 feet, and forms immense forests in the northwest of America. The common silver-fir abounds upon the mountains of Central Europe and the north of Asia, and attains a height of 150 to 180 feet and an age of 300 years. It yields the clear turpentine known as Strassburg turpentine. The balm-of-Gilead fir is a native of North America, yielding Canada balsam. Spruce-beer is made from the small branches of the black spruce.

and the thread used by the Indians in sewing their birch-bark canoes is made from the roots of the white spruce.

Firdausi (*fêr-dōō'sē*), **Abul Kasim Mansur,** was the first and chief of modern Persian poets. The date of his birth is uncertain; he died in 1020 A. D. His great epic was the *Shāh Namāh* or Book of Kings, upon which he worked for 35 years. The poem traces the fortunes of Iran, even from the time of the legendary kings, including the great Jamshīd, who in the golden age reigned 500 years. The chronicle or, rather, epic closes with the fall of Persia before Islam. The poem was presented to Mahmud of Ghazni, but so petty was his reward that Firdausi wrote a bitter satire upon the monarch, and fled the country. A work of his old age is a poem upon Joseph and Potiphar's wife, as told in the *Koran.*

Fire-Damp is the miner's term applied to coal-gas when it issues from crevices in coal mines. The issue of the gas can sometimes be heard, and it can be lighted. When it has from a quarter to a sixteenth part of air, it will explode, producing disasters that are too well-known in the history of mines. The explosion stirs up the coal-dust, and as each particle is fired the result is like the firing of grains of gunpowder.

Fire-Engine, a machine for the purpose of throwing water to extinguish fires. Machines for this purpose were employed by the Romans, as Pliny speaks of them, and so does Hero of Alexandria. There are accounts of instruments for fires being used in Augsburg in 1581 and in Nuremberg in 1657. By 1730 Newsham, in London, had made successful fire-engines; the first used in the United States (in 1731) were of his make. The simplest engine consists of a force-pump and a cistern for water. In the larger engines there is no cistern; the suction-pipe is carried directly to the water-supply. The first fire-engine in which steam was used was that of Braithwaite in 1829; Ericsson made a similar one in New York in 1840. The heaviest American engine, with water in the boiler and men on the engine, weighs over five tons. Chemical fire-engines are used to extinguish fires in small spaces; they depend on the rapid production of carbonic-acid gas, which is an enemy to all kinds of combustion. See Roper's *Handbook of Modern Steam Fire-Engines.*

Fire-Extinguisher, a term generally applied to a number of chemical agents, which extinguish fires by forming carbonic-acid gas. Fire-extinguishers are so made that they may be carried on the back and their stream directed by the hand.

Fire'fly, an insect capable of emitting light from some part of its body. These insects light marshes and wet meadows, the banks of streams and ponds, and frequently are very abundant. Those of tropical countries are most brilliant. In tropical America several are confined in a cage to give light. For the most part they are soft-bodied beetles of small or medium size, and fly at night. The luminous spots are yellowish in daylight. These are located on several joints of the lower side of the abdomen, and are richly provided with air-tubes. It is believed that the bright light is due to oxidation of the contents of the cells in the luminous patches. At any rate, phosphorus has nothing to do with it. In the United States they usually are called lightning-bugs. In Europe there are certain kinds in which the female is without wings, and has luminous patches on the abdomen. These and larvæ that are luminous are called glow-worms.

Fire'proofing. The word fireproofing may mean the ways of so constructing buildings, safe-deposit vaults etc. as to make them capable of resisting the action of fire, or it may mean the coating of such combustible materials as wood and textile-fabrics, making them as fireproof as possible.

The means used to make buildings fireproof is, in general, to avoid as far as possible in their construction the use of combustible material, particularly wood; stone, brick, iron and cement being largely substituted for it. Of course most so-called fireproof constructions are only relatively so. If wood is carefully coated with a solution of silicate of soda, it will usually resist a high degree of heat without undergoing serious injury. A 20% solution of tungstite of soda is much used for making linen or cotton-materials fireproof. The textile is steeped in the solution and then dried. Different kinds of solution are used, varying with the different kinds of materials to be rendered fireproof. Some of the solutions used are apt partly to destroy the fabric. Fireproofing of this nature is extensively used for the canvas-material from which the stage-scenery used in t eaters is constructed. If this scenery is not made fireproof, there is danger of great disaster, as theatrical contrivances are often such as easily to start a blaze. There are some paints that are claimed to make wood fireproof. These often contain sodium silicate and zinc chloride.

Fire'works. The art of making fireworks is called pyrotechny. They are made of some explosive material, of different colors and shapes, and used usually for amusement, though the rocket has been used for a signal in war. The powder generally used in fireworks is made on the same principle as gunpowder, and (besides the powder) niter, sulphur and charcoal are the main ingredients. Iron or steel-filings brighten the fire; zinc-filings give it a fine blue color; copper-filings give it a greenish tint. Yellow is produced by

amber, resin and salt, and lampblack makes the fire red. Firecrackers, torpedoes, Roman candles, rockets, wheels etc. are among the common fireworks. The present form of fireworks, of course, does not go back of the invention of gunpowder; but the Chinese, who excel in the manufacture of them, had some form of them in use from an unknown period.

Fish-Culture. The importance of fishes as food has led to the formation of commissions by different governments for their care and spread. The culture and protection of certain kinds of fish was practiced as a private enterprise from 1750 onward, but the first public hatcheries were established in France in 1850. Soon after, in 1865, fish-hatching began in the United States, in New Hampshire, Vermont and Massachusetts. The United States now gives greater attention to the culture, propagation and spread of fishes than any other nation. A United States fish-commission was created in 1871, with Spencer F. Baird as fish commissioner. Attention was very early given to the propagation of shad, and the number of those fish greatly increased. In 1880 the rivers of Georgia were stocked with shad, and in the course of four or five years they were caught there in abundance. In 1890 the catch of shad along the Atlantic coast was two and one half times as large as in 1880. The government pays for the support of the United States fish-commission about $150,000 annually; and, in addition, more than 30 of our states support state fish-commissions.

The work of preserving and increasing our food-fishes consists in keeping the waters free from contamination by mills, sewage and other causes; in establishing laws to control the methods and seasons of fishing, in the cultivation of proper food-elements; and in the hatching and distribution of the young fish. Fish-breeding is practiced in many fish-hatcheries. The eggs are sometimes collected from the spawning-grounds; at other times fishes are obtained in a ripe condition and the eggs are pressed out by running the thumb along the under surface of the abdomen. The milt is then pressed out from the male fish and spread over the eggs. Thus they are artificially fertilized, and it is found that by this method a much higher percentage of the eggs is fertilized and developed than in the natural spawning-grounds. The eggs are now protected and reared in boxes and jars provided with running water. In some cases the young are fed by finely divided liver or other suitable food. After they reach a certain size, the young fish are shipped, and distributed in lakes, rivers and ponds. The United States government and several of the state fish-commissions have special cars, fitted with tanks, for transporting fish. The supply of fishes has been greatly increased, and new kinds introduced into various sections of the country. Fishes have also been transported across the ocean; our trout have been carried to Japan and Great Britain, and we have received salmon and trout from Europe. Shad and striped bass have been carried from the eastern to the western districts, white-fish fry have been extensively planted in the great lakes, and the range of black and striped bass and other fish has been greatly extended. The extent of the work of distributing fish is great. Some of the states (Michigan, Wisconsin, New York, Pennsylvania) have distributed from 40,000,000 to 135,000,000 of fish in a single year. The term fish-culture and the work of the United States fish-commission have broadened to take in the protection and care of the seal-fisheries, of lobsters, oysters etc. See the various publications of the United States fish-commission.

Fish, Hamilton, American diplomatist, was born at New York on Aug. 3, 1808, graduated at Columbia College, and was admitted to the bar in 1830. He was a Whig in politics, was elected a congressman in 1842, lieutenant-governor of New York in 1847 and governor in 1848. In 1851 he was returned to the United States senate, and acted with the Republican party. From 1869 to 1877 he was secretary of state under Grant, signing, as one of the commissioners, the Washington treaty of 1871, which settled the Alabama question. He died at Garrison's, N. Y. on Sept. 7, 1893.

Fish'er, George Park, an American clergyman and church-historian, was born Aug. 10, 1827, at Wrentham, Mass. He graduated from Brown University in 1847 and, after a course of study in Germany, was made professor of divinity in Yale College in 1854 and of ecclesiastical history in 1861. Among his best-known writings are *History of the Reformation, Beginnings of Christianity, Grounds of Theistic and Christian Belief* and *Nature and Method of Revelation.*

Fisher, Admiral Sir John Arbuthnot, was born in 1841, entered the British navy in 1854, and took part in the capture of Canton and the Peiho forts in 1860. He served in the Crimean, Chinese and Egyptian Wars, commanding *The Inflexible* at the bombardment of Alexandria in 1882. He has successively occupied the following posts: Director of Naval-Ordnance (1886–91); Admiral-Superintendent of Portsmouth dockyard (1891); Lord of the Admiralty (1892–7); Commander-in-Chief on the North American and West Indies station (1897–9); delegate to the Hague peace-conference (1899); Commander-in-Chief on Mediterranean station (1899-1902); second Sea-Lord of the Admiralty (1902-3); Commander-in-Chief (1903-4); first Lord of the Admiralty (1904 to 1915). He died in 1920.

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GROUP OF FISHES

Land-locked Salmon. Common Mackerel. Weak-fish. Striped Bass. Shad. Bluefish White-fish.
Canada Red Trout. Brook Trout. Wall-eyed Pike

Fishes, aquatic vertebrates, breathing by gills. They are very numerous, and are of interest to the sportsman as game, to people in general as food and to the scientific student. Excluding the lancet and the *Cyclostomata* as below the true fishes, there are four orders left. 1. Bony or modern fishes (*Teleostei*). This is far the largest group, including most of the food and game fishes both in fresh and salt water, as cod, bass, perch, pike, trout, mackerel, etc. 2. Ganoid or ancient armored fishes (*Ganoidei*), including fishes with shiny hard scales, like the garpike, sturgeon, bowfin, etc. Representatives of this order are found as fossils in very ancient rocks, while the first order occurs as fossils only in relatively modern rocks. 3. Mudfishes, or double breathers (*Dipnoi*), including fishes that possess both gills and lungs, being the lowest vertebrates to have lungs. These first lungs are formed from the air-bladder, which is interesting, as it gives us a clue to the origin of lungs. These fishes live in the waters of Africa and Australia that dry up, and they form for themselves mud cases in which they live till the water returns again. The heart is imperfectly three-chambered, and by this and the possession of lungs they are closely allied to the *Amphibia.* 4. Cartilaginous fishes (*Elasmobranchii*), fishes with a cartilaginous skeleton and brain-case, instead of a bony one, including sharks, rays, skates, torpedoes, etc.

Fishes make a natural group or class. They have a two-chambered heart, consisting of an auricle and ventricle. They have gills and blood vessels running in the gill-arches that are called aortic arches—usually four or five in number. These run around the pharynx and unite above into the aorta or great artery. The blood is sent out from the heart to the gills; there it takes in oxygen and continues its circulation as arterial blood; and, passing through the capillaries of the body, it returns to the heart as venous blood. Fish have fins, supported by fin-rays, for swimming. Their colors vary, and often are brighter during the spawning season. Their food is diverse, many of them eating smaller fishes, crustacea and worms, while others feed upon plants; some few swallow mud for the sake of the organic matter contained in it. Their eggs are usually laid in immense numbers; for example, the whitefish or trout lays about 50,000 eggs in one season. Some forms, like sharks, lay few eggs, which are either retained within the body till hatched, or, in closely related species, are laid in the water, enveloped in a horny case. The horny cases of skates and sharks are called mermaid-purses. Some forms, like sticklebacks, build nests and care for the eggs until hatched. All fishes possess a set of sense-organs that are fitted to receive vibrations from the water, called the sense-organs of the lateral line. If any common fish be examined, there will be seen a line running on each side about the middle of the body. This is the position of the lateral line. These organs exist also in the tadpole stages of frogs and toads, but disappear when the animals leave the water, and are not present in land animals. Deep-sea explorations have brought to light many strange and curious fishes, some of them having luminous spots, from which light is emitted. See BLINDFISH, CARP, COD, GOLDFISH and others in alphabetical order. See Goode's *American Fishes;* Baskett's *The Story of the Fishes;* and Jordon's *Fishes* (1907).

Fishhawk or **Osprey,** a common well-known bird of eagle-like appearance, found in all countries, except Iceland and New Zealand. It is abundant in the United States along the Atlantic, and is also found inland in the vicinity of water. The American osprey is about two feet long; brownish above and whitish below; the upper part of the beak is strongly curved over the lower, and the claws are long and sharp, being especially formed for grasping. These birds feed exclusively on fish, and are expert fishers. They fly to and fro above the water and make a sudden dash after fish near the surface, sometimes going into the water to a depth of about one and one half feet. Their feathers are compact and oily, and do not become wet. The bald-headed eagle often chases the osprey, and robs it of its fish while in the air. In America the osprey nests on large trees, in Europe on rocky cliffs. The great nest is built of sticks, sea-weed and other material, and is used year after year. The two to four eggs vary in color, sometimes being white, again buff or chocolate. Ospreys mate for life, show much family affection, often make of the nest an all-year-home.

Fiske, John, an American author and historian, was born March 30, 1842, at Hartford, Conn. Graduating from Harvard in 1863, he became known as a deep thinker and forcible writer. In 1861 he made his mark with a notable critique on the fallacies in Buckle's history of English civilization. From 1869 to 1879 he was at Harvard, first as a brilliant lecturer on philosophy, then as assistant-libra-

JOHN FISKE

rian. The earlier recognition of him was chiefly of the expounder of evolutionary philosophy, and his lucidity in popularizing Spencer was admired by Darwin. After 1879 he devoted himself chiefly to American history, though his *Idea of God* (1885), *Origin of Evil* and *Through Nature to God* gave his last answers to questions in philosophy and religion. His histories extend from the earliest discoveries to the beginnings of Federal government; cover almost every phase of American life; and have dramatic interest as well as great historical value. As a lecturer and writer on philosophy and history, he took high rank among American authors, while he did much to elucidate and popularize the doctrine of evolution. Among his works are *The Destiny of Man; Outlines of Cosmic Philosophy; American Political Ideas; The Discovery of America; The Beginnings of New England; Civil Government in the United States; The American Revolution; Old Virginia and Her Neighbors;* and *The Dutch and Quaker Colonies in America.* He died at Gloucester, Mass., July 4, 1901.

Fiske, Minnie Maddern, born in New Orleans in 1865, is a well-known American actress of the realistic school. Like many other successful actresses, she spent even her childhood upon the stage. In 1890 she married Harrison Fiske. Some of her greatest successes have been made in *Becky Sharp,* in Ibsen's *A Doll's House* and in Hardy's *Tess of the D'Urbervilles.*

Fitch, John, inventor, was born in what is now South Windsor, Conn., in 1743, and is said to have committed suicide in the summer of 1798. In 1785 he completed his first model of a steamboat, which had wheels at the sides, replacing them in the following year with paddles. In the face of discouragement he built a vessel 45 feet long, which made a successful trial trip on the Delaware at Philadelphia, Aug. 22, 1787. A larger one was built in 1790, and attained a speed of eight miles an hour. Robert Fulton's steamboat was, in 1817, declared by a committee of the New York legislature to be "in substance the invention patented by John Fitch in 1791."

Fitch'burg, Mass., a city in Worcester County, Massachusetts, on Nookagee River. The city has grown a good deal during the last ten years. It has a well-equipped fire-department with over 75 telegraphic fire-alarm stations. The city has more than a score of churches and some 30 school-buildings, the latter valued at over $300,000. There also is a public-library and art-gallery building costing $90,000, given to the city by one of its public-spirited citizens, and $450,000 have been donated by another for a public hospital. The library contains close upon 30,000 volumes. There are many manufactories, the chief being paper-mills, machine-shops, iron-foundries, pianoforte, saw-factories, cotton, woolen and flour-mills, shoe and shirt-factories and bicycle, electrical apparatus and wood-turning establishments. Population 37,826.

Fitchett, Rev. William Henry, was educated at Melbourne University, has been president of the general conference of the Methodist church of Australasia, is principal of the Methodist Ladies' College at Melbourne, was former editor of the Melbourne *Daily Telegraph,* and is now in charge of the editorial interests of *The Southern Cross* and *Life.* He is even better known for his stirring recitals of British fighting on land and sea, his published works including *Deeds that Won the Empire, Fights for the Flag, How England Saved Europe, Wellington's Men, Nelson and His Captains* and *The Commander of the Hirondelle.* These works are circulated and read throughout the English-speaking world.

Fitzpatrick, Hon. Sir Charles, was born in the city of Quebec in 1853, and educated at Laval University. For six years (1890–6) a member of the Quebec Legislature, he was elected to the House of Commons in 1896. He was solicitor-general and, afterwards, minister of justice in the Laurier administration. He became chief-justice of the supreme court in 1906.

Five Forks is a place in Dinwiddie County, Virginia, known to history as the site of a battle fought between the Union forces under Gen. Phil. Sheridan and the Confederate army under General Lee, on April 1, 1865. General Sheridan won the battle, the result of which was the evacuation of Petersburg on April 2, Richmond falling shortly afterward.

Flag, a strip of some light cloth attached at one end to a staff, used as a local or corporate emblem by a nation or city for military and naval purposes; to express rejoicing, mourning and the like; or to make known some fact to spectators. Flags are supposed to have had their origin in the fixed standard of the Romans. One of the earliest known flags was the gonfalon, borne near the person of the commander-in-chief in battle. Besides this, there were three kinds used in the middle ages: the pennon, used by a knight who had followers to defend it; the banner, borne by a king, prince, duke or other noble, with the owner's coat of arms covering its entire surface; and the standard, used among persons of distinction in the 14th, 15th and 16th centuries. In most countries, except republics, the sovereign has his own flag. The stars-and-stripes of the United States was adopted by Congress on June 14, 1777, nearly a year after the Declaration of Independence, and consisted of 13 stripes alternately red and white and a device of 13 white stars on a blue ground in the upper corner nearest the staff; the number

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FIRST FLIGHT OF "OLD GLORY"

The Flag of the "Stars and Stripes" adopted by Congress, June 14, 1777, was first displayed at Ft. Staniwix (now Rome, N. Y.), August 2, 1777

of stripes and stars agreeing with the number of states. There are many theories of the origin of our flag, but none is satisfactory. Washington's arms contain the stars and stripes, but they are neither blue, red nor white. It will never be known who designed the union of stars. It is claimed that in 1776 Mrs. John Ross of Philadelphia, at the suggestion of Washington and George Ross, made and partially designed the first national flag combining stars and stripes. It was first displayed at Fort Stanwix, now Rome, N. Y., on Aug. 2, 1777, and Paul Jones asserted that he was the first to display it at sea, but it was slow to get into general use. In 1818 it was enacted that the stripes should continue to be 13, that the stars should be 20 in number, there being then 20 states, and that a star should be added for every new state coming into the Union. In 1907 the number of stars had increased to 46. The flag of Great Britain has the insignia of England, Scotland and Ireland on a quartered field, two quarters red, one yellow and one blue. The naval flag, called the Union Jack, has a blue ground, crossed by the crosses of Saints George, Andrew and Patrick. The French flag, called the tricolor, has three broad, perpendicular stripes of blue, white and red. The German imperial standard is yellow, divided by the iron cross into quarters, on each of which are three black eagles and the crown, with the imperial arms on a gold shield in the center. The German merchant-flag is of red, black and white in horizontal stripes. The Russian flag was yellow, with the Russian arms. The flag of Denmark probably is the oldest in existence, dating from the 13th century, and is red, with a white cross. The flag of Turkey is red, with a white crescent moon and eight-pointed star. By the consent of all nations a flag of truce is white; striking the flag denotes surrender and placing the flag of one country over that of another indicates victory; flags at half-mast mean mourning; the red flag mutiny; the black flag a pirate; and the yellow flag quarantine.

Flag-of-Truce. A white flag raised by one party in time of war to indicate to the opposing party their desire to communicate with them, as, for example, concerning terms of settlement or capitulation. There are certain rules in connection with the use of the flag-of-truce, the observance of which has come to be considered by nations as morally obligatory. While it is not at all necessary that hostilities should be suspended, or firing stopped, upon the erection of a flag-of-truce, the deliberate shooting of the bearer of a flag-of-truce is considered to be a very disgraceful and unjustifiable act. On the other hand, to use a flag-of-truce as a means for spying upon the resources of the enemy or other such illegitimate purpose, is considered especially dishonorable. The bearer of a flag of truce may be held by the enemy, if deemed advisable. Flag-of-truce proceedings, to be regular, must be conducted by the senior officers of the respective forces. In naval engagements the vessel bearing the flag-of-truce is usually kept off by the recipients at a safe distance, unless her harmless character is clearly apparent, in order to avoid the possibility of treacherous use of torpedo-boats, etc.

Flamin'go, a bird with very long legs, a long neck and very singular bill. Formerly the flamingo was classed as a wading bird, but now it is frequently united with the ducks, or placed in a group by itself between ducks and geese, and herons and storks. It is the long legs and neck that made the true relationships obscure. The lower part

FLAMINGO

of the bill forms a deep, broad box, into which the upper part fits like a cover, and the whole is bent abruptly downward in the middle. The margins are provided with ridges arranged crosswise as in the duck's bill. Much mud is taken with the food (small crustacea, mollusks, vegetables), and is afterward strained out between the furrows on the bill. There are about eight species living (they were more numerous in geological times) in tropical and subtropical countries. Only one species is found in the United States, in the marshes of Florida and Louisiana. It is rose-colored and deep red; the young are white. In zoological gardens flamingoes lose their bright colors. The nests are of mud, from a few inches to a foot and a half high, and the birds sit with legs folded under the body, not, as was formerly supposed, astride the nest.

Flammarion (*flà'mà'rē'ôn'*), **Camille,** French astronomer, was born at Montigny-le-Roi (Haute Marne), on Feb. 25, 1842 and educated at Langres and under Leverrier in Paris. In 1862 he founded a monthly

review dealing with astronomical matters, and has written extensively on the heavenly bodies, founded astronomical societies and observatories, etc. Among his more notable works, many of which are to be found in English translations, are *The Plurality of Inhabited Worlds*, *God in Nature*, *The Atmosphere*, *The Stars and the Curiosities of the Heavens*, *Urania*, etc. M. Flammarion takes a lively interest in the planet Mars, and has made many balloon-ascents to study the condition of the atmosphere at great altitudes.

CAMILLE FLAMMARION

Flan'ders, the country of the Flemings, lying on the North Sea, embraced the present Belgian provinces of East and West Flanders, the southern portion of Zealand in Holland and the greater part of ancient Artois in France. It was originally inhabited by Belgic tribes, on whose subjection by one of Cæsar's lieutenants it was added to Roman Gaul. It was afterwards overrun by Franks, and, by the treaty of Verdun, Flanders was added to Neustria. The first government of the country was presided over by a count, Baldwin I, appointed by the king of France in 837. The town of Valenciennes was added in 1006, as were also Ghent and the Zealand Islands. Under Baldwin V the counties of Alost, Tournai and Hainault were added. On his death the Netherlands portion was set aside for Baldwin's younger son, who, on the death of his elder brother, wrested Flanders from the widow, leaving to her and her son Hainault only. From this time to the end of the 12th century the Flemish territories remained thus divided. In the 10th and 11th centuries Flanders rose to be the chief center of wool-weaving in Europe. In 1256 the Zealand Islands were given to the count of Holland, and they still remain in Holland's possession. From 1302 to 1320 the Flemings struggled successfully with France. In 1529 France resigned her claims to Flanders, and with the accession of Philip II to the throne of Spain the history of Flanders becomes identical with that of the Spanish Netherlands. The treaty of Westphalia transferred Dutch Flanders to the United Netherlands, whilst by the treaties of the Pyrenees in 1659, Nimeguen in 1678 and Utrecht in 1713 Louis XIV succeeded in adding to France Artois and a large part of French Flanders. By this last treaty and that of Rastadt, in 1714, the remainder of Flanders was assigned to Austria, and is known as the Austrian Netherlands. On the formation of the new kingdom of Belgium, in 1831, the provinces of East and West Flanders were united with it. The area of these provinces is 2,408 square miles, with a population of 2,004,784. West Flanders abuts on the North Sea, and has a fertile soil, good for growing flax and cotton, and is also noted for its cattle and leather-trade The people of both provinces are chiefly Roman Catholics and of Flemish stock. Ghent (pop. 164,659) is the capital of East Flanders; while Bruges (pop. 53,995) is the chief town of West Flanders, with its seaport of Ostend (pop. 41,698). The active industries of West Flanders include fishing, lace-making and spinning and weaving linen, together with the growing of flax, hops and tobacco. In East Flanders the industries are much the same, in addition to cattleraising and the manufacture of cloth and paper. The two principal rivers are the Scheldt and the Lys.

Flandrin (*flăn'drăn'*), **Jean Hippolyte,** an historical and portrait painter, was born at Lyons, France, May 23, 1809. Between 1842 and 1845 he decorated many churches in France, and was ranked as the greatest religious painter of the century. His great frescoes, *Christ Entering Jerusalem* and *Christ Going up to Calvary*, in the church of St. Germain, at Paris, and his picture of *St. Clair Healing the Blind*, in the cathedral of Nantes, are among his best-known works. He died at Rome, March 21, 1864.

Flat'fish, the name given to a number of salt-water fishes, flattened from side to side like the flounder, halibut, plaice, sole and turbot. Some fishes are flattened from above, like skates, torpedoes, etc., but these are not called flatfishes. The true flatfishes have lost their symmetry, both eyes come to occupy one side, and the mouth is twisted. They lie on the bottom with the blind side downward, and, in swimming, progress through the water with this side underneath. The upper side is colored, but the under side is whitish. When these fish are first hatched, both sides are alike and the eyes are symmetrically placed right and left. Soon they begin to become flattened, and the eye of one side travels gradually over the crown of the head and becomes placed close to the other eye. The mouth also becomes twisted. In the meantime the fish turns on one side, and, in swimming or resting, keeps the blind side downward. The colors also disappear from this side. Recent experiments tend to show that if the blind side is kept illuminated by light reflected from a mirror, the white side will remain colored or develop its color again.

Flat'heads, a term applied to the Selish Indians, a small tribe dwelling on Clark's

Fork, in Idaho. The men are industrious and have become good farmers, and, although brave and good warriors, have never fought against the whites. Their name refers to the ancient practice of flattening the skulls of young infants in various ways, as was done in Peru before and after the arrival of the Incas, among the Caribs in Central America, Mexico and Florida and among the mound-builders of the Ohio and Mississippi valleys. Among modern Indians the practice is mostly confined to the Chinooks and other tribes of the northwestern coast of North America.

Flax. Species of the genus *Linum*, and especially the cultivated flax, *L. usitatissimum*. The genus contains about 80 species, belonging to the temperate regions both of the northern and southern hemispheres. The flowers are bright and showy and remarkably regular. The common flax has been cultivated from ancient times, and is unknown in its original wild state. It is cultivated not merely for its valuable fiber but for linseed or flaxseed oil. The fibre is used for the coarsest as well as the finest fabrics, and is not only valued for finest linen cloth and filmy lace but is employed in the body of cordage and rope. It was raised in Egypt in the days of the Pharaohs; has been famous for ages; and is still grown there in large quantities. Of the European countries where it is extensively cultivated Russia, Belgium and Ireland stand to the fore. Cultivation of it was begun in America by the early settlers, and some impetus given when the supply of cotton was cut off by the Civil War. Of late flax-culture for fibre has been receiving increasing attention. It will grow in almost all parts of the United States, but requires a great deal of care and labor. The flaxseed production of the United States in 1906 was 25,576,146, bushels.

FLAX

Flea, a small, wingless insect with a sharp pointed beak, by means of which it punctures the skin of animals upon which it lives, leaving a red, itching blotch. These insects have powerful legs, and are remarkable jumpers. Fleas live on the dog, cat, rabbit, pigeon and poultry. The fleas of the dog and the cat will also attack man, but there is another species of fleas known as the human flea. To rid a dog or cat of fleas, the animal should be dusted with Persian insect powder, and the sleeping-places thoroughly cleaned. The human flea is not very abundant in the United States, except in warm, sandy districts, but they are common in Europe. In northern Africa and in some eastern countries they are a terrible torment. A single flea will inflict many bites. As a protection, the tops of the stockings should be dusted with insect-powder, and it may also be sprinkled between the sheets at night.

Fleur-de-Lis, a symbol in heraldry, meaning literally flower of the lily, is famous as the emblem of the kings of France in the middle ages. The full device was three lilies on a blue field or ground. The origin of the fleur-de-lis in nature appears to have been, not the lily proper, but the iris-plant. Its conventional form has been traced back to the ancient Etruscans.

Flicker, a bird with many names, a member of the woodpecker family. It is known as Yellow-Hammer, High-Hole, Golden-Winged Woodpecker, etc. It is a large bird, considerably larger than the robin. When flying, it displays a shimmer of yellow and a flash of white; the wing-shafts and lining and tail-quills are a rich yellow, the tail white on the upper side. Above, it is a grayish brown barred with black, wings black and yellow, a noticeable patch of white low on the back, the head gray. It wears a noticeable top-collar of a beautiful shade of red; the light color underneath is thickly dotted with black, with a black crescent on the upper part of the breast. He is a handsome fellow and yet, on the ground, not conspicuous, his protective coloring being that of the ground, where he frequently feeds. Ants are his chief food. Though a woodpecker, he leaves most of the boring to other members of the family, and gets his ants from the ground or from decayed wood. He is not above using another woodpecker's deserted nest, but often bores nests in apple trees and decayed stumps; sometimes the nest is found 60 feet up from the ground. Six white eggs are the rule. The breeding-range is throughout the eastern states.

Flint, a mineral, a variety of quartz, consisting almost entirely of silica, with a little lime, oxide of iron, water and, sometimes, carbon. It varies in color from almost black to light brown, red, yellow and grayish white, and is sometimes mottled or spotted. Flint is often found imbedded in chalk, and is also found in beds or veins. It was used to strike fire with steel and in firearms. The most ancient use of it was for sharp weapons and cutting instruments. It was also used by American Indians for arrowheads.

Flint, Austin, American physiologist and writer, was born at Northampton, Mass., on March 28, 1836, and graduated in 1857

from Jefferson Medical College, Philadelphia. In 1859 he removed to New York, and, after filling the chair of physiology in a school of medicine in New Orleans, became professor of physiology and microscopic anatomy in the Bellevue Hospital medical college and lecturer in the Long Island college-hospital. In 1874 he was appointed surgeon-general of New York state. He is the author of a number of important medical treatises, among which are a *Textbook of Human Physiology; The Source of Muscular Power;* and *Physiology of Man.*

Flint-Implements of the primitive people of prehistoric times are commonly found on the graves or on the sites of settlements of the earlier inhabitants of almost every country in Europe. They consist of spearheads, arrowheads, daggers, knives, saws, borers, scrapers, chisels and axes. No modern savages or barbarous tribes have produced anything so finely finished as the weapons and implements of the prehistoric peoples. Some of them, as the knife-blades and dagger-blades of Denmark and Sweden, are marvels of workmanship. Flint is the only kind of stone capable of being worked into a variety of shapes by flaking and chipping. See *Ancient Stone Implements* by Evans.

Flint, Mich., 60 miles northwest of Detroit, is served by the Chicago and Grand Trunk, Flint & Pere Marquette, Detroit United Electric, and Saginaw & Flint Electric railroads. Flint has vehicle factories, brick works and manufactures Buick, Chevrolet, Mason, Paterson, and Dort automobiles, employing 19,000 people. A Deaf and Dumb Hospital and the Oak Grove sanitarium for mental diseases are located there. Flint had the biggest percentage of growth between 1900 and 1910 of any city of over 25,000 in the United States. Population, 52,000.

Flodden, Battle of, fought on Flodden Hill on the Scottish borders, between James IV of Scotland and an English army under the Earl of Surrey, Sept. 9, 1513, was the most grievous defeat that Scotland ever suffered. King James had 30,000 men, and the Earl of Surrey 32,000; the former lost from 5,000 to 12,000 men, including the archbishop of St. Andrews and 12 earls, and the latter 4,000 men. The sixth canto of Sir Walter Scott's *Marmion* contains a splendid and fairly accurate description of the battle. See Robert White's *The Battle of Flodden* and Scott's *Marmion.*

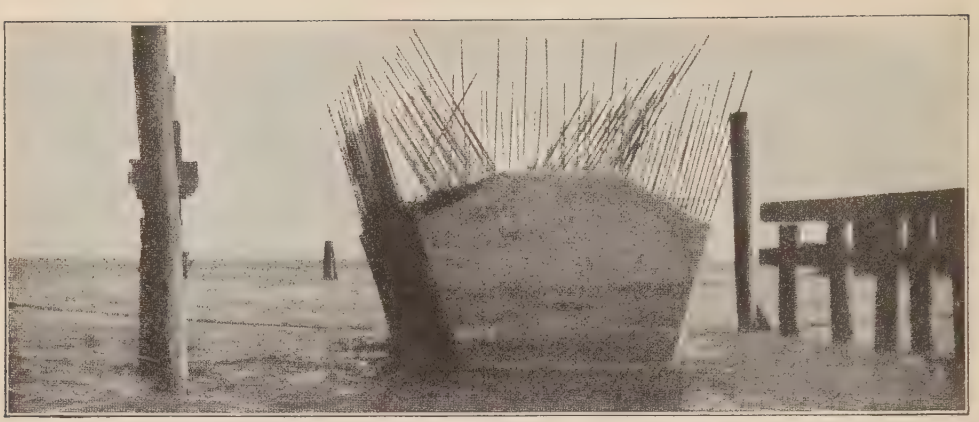
Flood-Plains are level tracts of land which have been formed by the sediment deposited by a river when in flood The flood-plains of the Nile, the Mississippi, the Po and other rivers are of great extent and very fertile. Frequently the course of a river changes by a gradual swing to one side, owing to the settling of sediment in its own channel, and in this way a *delta* of flood-plains is apt to be formed, as in the case of the Nile and the Mississippi, at its mouth.

Flora, an ancient Italian deity, the Roman goddess of flowers. At Rome she had two temples. She was represented as a flower-crowned maiden, in the full bloom of maidenly beauty. On the occasion of her festival, held at the end of April, the dwellings were decked with flowers, and feasting, dancing and singing prevailed everywhere.

Flor'ence, a city of Italy and capital of the province of Florence (Firenze), is situated in the valley of the Arno. The province of Firenze has an area of 2,265 square miles, with a population of 995,048. The establishment here in 1864 and 1865 of the seat of the Italian government was the means of increasing the city to nearly double its former extent. The chief building in the city is the cathedral, the foundations of which were laid in 1298; while in 1887 the finished building was uncovered with great pomp in the presence of the Italian sovereigns. The dome served Michael Angelo as a model for St. Peter's. The church contains sculptures by Michael Angelo and other famous artists. There are many other handsome churches in Florence, containing a wealth of paintings and sculpture. Among the famous palaces are Il Bargello, Vecchio, Signoria, Uffizi, Pitti, Riccardi and Strozzi. The Pitti palace contains the national library, with 200,000 volumes and 10,000 manuscripts, and the famous Florentine gallery of art, filling 23 rooms. The city of Florence sprang originally from Fiesole, at the foot of which it lies extended. In the 11th century it was bequeathed to Pope Gregory VII, and, under the protection of Rome, became a city of importance. By 1250 it had become one of the first cities of Italy and held its place for many years. In 1348 the black death carried off 100,000 of the city's inhabitants. In 1529 the city was besieged by an army under the duke of Orange and fell Aug. 8, 1530. After the constitution of the united kingdom of Italy, Florence held the position of provisional capital from 1864 to 1871. Its population is about 227,000. In art Florence holds a unique place, the Florentine school being the most important in Italy. In literature its position is hardly less important, as is attested by the names of Dante and Boccaccio. See Mrs. Oliphant's *The Makers of Florence;* Ruskin's *Mornings in Florence;* George Eliot's *Romola.*

Flor'ida, meaning the land of flowers, is the most southern portion of the United States. It is a peninsula, bordered by the Atlantic Ocean and the Gulf of Mexico. It covers an area of 58,680 square miles of which 4,400 square miles are water, and is about 450 miles long and 100 broad.

Surface and Drainage. It is for the



BUILDING PIER OF CONCRETE WITH STEEL REËNFORCEMENT

BUILDING CONCRETE ARCHES SHOWING FRAMEWORK

SECTION OF FLORIDA KEYS RAILROAD, BUILT ACROSS OPEN SEA

most part a swampy region; its lakes, which number about 1,200, and marshes and swamps covering about a fifteenth of the state. The Everglades are an example of these swamps. The Okeechobee is the largest lake. As a peninsula, it has a very long coast-line, of about 1,150 miles, with harbors at Fernandina, St. Augustine, Key West, Cedar Keys, Tampa and Pensacola Bay; it also has innumerable islands. There are 19 navigable rivers, the longest being the St. John's. This river is about 300 miles in length, one third of which can be navigated.

Climate. The climate is very healthful, and not intensely hot, being moderated by the sea breezes. There are 250 clear days in the year.

Natural Resources. With its extensive coast-line, Florida has a large fish-trade, the chief seat of which (in fresh fish) is Pensacola. About 8,000 men are employed in the fisheries. Alligator-hides are obtained here, besides sponge and coral. Of minerals, the most important is phosphate-rock, the value of this product amounting yearly to over $4,250,000. Mineral waters, lime and fullers' earth also are among its exports. There are said to be 25,000,000 acres of forest-land, upon which is found a very great variety of trees. Among these are hickory, live oak, long-leaved pine, pitch-pine, cypress, the wild orange, Indian almond, mahogany, satin-wood etc.

Products. The products are lemons, oranges, pineapples, figs, bananas, cocoanuts and other tropical fruits, with coffee, rice, cotton, tobacco, sea-island cotton, sweet and irish potatoes, melons, sugar-cane, peanuts and cassava, besides corn and other cereals for local use. Its most important crops, however, are oranges and pineapples.

Industries and Manufactures. Market-gardening and fruit-raising for the northern markets are among the principal industries, which also include the preparation of pine and live-oak timber used in shipbuilding, cigar-making, the production of turpentine, tar, resin and pitch, cotton-seed oil and sponge and coral fisheries. The manufactures of the state amounted in value to over $72,000,000 in 1909. These, besides the forest-products include fertilizers, cotton-seed oil, wooden boxes and barrels and cedar for lead-pencils; but the leading industry is the manufacture of tobacco and cigars. The assessed valuation of property in the state is now in excess of $177,000,000.

Education. There are numerous colleges and public schools, including the University of Florida, at Gainesville, State College for Women and Agricultural College for Negroes, at Tallahassee, all having normal departments, and School for the Deaf and Blind, at St. Augustine. There are also private and denominational schools, among them being Rollins College and the John B. Stetson University, the latter affiliated with Chicago University. The public schools have a teaching staff of 4,500 and about 155,000 pupils.

Cities. The state has developed rapidly within the last few years, and has become a popular winter-resort. Tallahassee is the capital, and Jacksonville, St. Augustine, Key West, Tampa and Pensacola are prominent cities. The revenue and disbursements about balance at $1,500,000 each, annually. Besides saving-banks, Florida has a number of state banks, with resources (exclusive of national banks) aggregating $15,000,000. In May, 1901, Jacksonville suffered severely from a conflagration, which destroyed nearly $15,000,000 worth of property.

History. Florida was discovered in 1512 by Ponce de Leon, when searching for the fountain of youth, and named by him the land of flowers. It was explored by De Soto in 1539, and in 1562 a colony of Huguenots settled there, who were massacred by the Spaniards. The first permanent settlement was made at St. Augustine, which is almost the oldest city in the United States, by Spaniards, who kept possession of the territory until 1763, when it was ceded to England in exchange for Cuba. From 1781 until 1819 Spain held the country again. Florida was ceded to the United States in 1819, organized as a territory in 1822, and admitted into the Union in 1845. From 1835 to 1842 it suffered from the struggle with the Seminole Indians, which ended with the removal of the tribe to Indian Territory. The state seceded in 1861, and was readmitted in 1868. Population, 904,839. See *The Florida of To-day* by J. W. Davidson.

Florida Keys are a group or chain of small islands stretching south from the southern coast of the Florida peninsula. There are thousands of them, many of them of coral formation and most of them submerged by high tide. The longest of them is Key Large, and the southernmost of any importance is Key West: Here is the city of Key West, the site of a naval station, with a population of 21,174, and a place of considerable commercial importance. It has lines of steamers connecting with the chief cities of the Atlantic coast. Its chief industry is the manufacture of cigars, and it also has a large trade in fish, fruit, tobacco, vegetables and sponges.

A vast and unique enterprise, the greatest engineering feat of recent years, is the railroad, which has been constructed from the mainland to Key West, a distance of 130 miles, bridging long stretches of open sea, with an equal distance built up on submerged swamps and shallows. The open water is bridged by miles of concrete viaducts, the shallows built up with solid

embankments of rock, and all made to withstand the assaults of the sea, driven by tropical storms.

This undertaking was the work of the late Henry M. Flagler, who had previously built a road along the Atlantic seaboard from Jacksonville to Miami, with its series

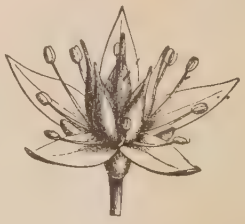
of magnificent hotels. His ultimate plan was to connect Key West with Havana by ferries which would carry solid trains, thus extending rail passenger and freight passage from New York into the island of Cuba.

Flotow (*flō'tō*), **Friedrich, Freiherr von,** a German composer, was born at Teutendorf in Mecklenburg, Germany, on April 26, 1812. He is chiefly celebrated for his operas *Martha* and *Stradella*, pleasing compositions of light and lively music. He died at Darmstadt on Jan. 23, 1883.

Flounder, a salt-water fish belonging to the group of flatfishes, with both eyes placed on one side of the body, which is kept uppermost in swimming or resting on the bottom. It is a good food-fish. See FLATFISH.

Flour is the powdered grain of wheat and other cereals separated from the outer husks or coverings — usually the powdered grain of wheat. Flour is far the most important part of man's food, rice being the only other cereal which rivals it in the number of human beings it feeds. Every indication points to the fact that the cultivation of wheat and other grains was one of the earliest developments of civilized man. From the remains found on the sites of ancient dwellings it looks as if grain was crushed in a hewn-out stone, and probably was no finer than the meal of the present day. A mortar and pestle were used among the ancient Romans for grinding grain, and during that period mills were introduced; a pair of millstones were found at Adel in Yorkshire, England, at the beginning of the 18th century. In England and Scotland it has not been definitely determined when water-mills were introduced, but it is known that in 560 hand-mills were in use. They were called querns, and consisted of two stones about a foot and a half in diameter, the lower one being a little convex, into which the upper one, being concave, fitted. At the present time flour-milling may be divided into four separate systems — flat milling or grinding; high milling or granulating; roller milling or crushing; and disintegrator milling or breaking. In all there are three main features — the cleaning and preparing of the wheat, the grinding and the bolting or dressing of the product. The stones used in the flat milling are usually about four feet two inches in diameter and 12 inches thick, and many grooves are cut in them. In roller-milling a pair of horizontal rollers rotate face to face, and crush the grain as it falls between them. The crushed product in all milling consists, in a general sense, of flour, bran and middlings. Flour is an important item of export to the people of the United States. Statistics regarding the flour-output of the United States vary. In 1900 the returns from 13,188 flour-mills, in 17 of the chief milling states and territories, showed that the average annual yield was 103,500,000 barrels, the value of which was $384,200,000. The export of flour in 1906-7 was 15,584,667 barrels; its value $62,175,397. The world's greatest milling center is Minneapolis. To make a barrel of flour requires from four and a half to five and a half bushels of wheat, according to the grading of the flour.

Flower. Technically a flower is a modified shoot, that is, it consists of a stem-axis bearing leaf-bodies. Both axis and leaves are variously modified. The modifications of flowers are endless, as every group of seed-plants has its own kind of flower. Taking the average flower by way of illustration, it is found to be composed of four distinct sets of organs, all of which are leaf-bodies which stand upon a very short or even flattened axis, technically known as the torus or receptacle. The two outer sets are the floral leaves, the two inner the sporangial leaves. The outer set of floral leaves is called the calyx, the individual parts being sepals. The ordinary



FLOWER

Meadow Lily

Wild Aster

Golden Rod

Wild Rose

Violet

Orchid

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sepals are green and leaf-like, but usually small as compared with the next set. The inner set of floral leaves is the corolla, the individual parts being called petals. It is the corolla which usually gives the display of the flower, the petals becoming delicate in texture, comparatively large in size and variously colored. The outermost set of sporangial leaves is composed of the stamens. Each stamen usually consists of a stalk-like portion, called the filament, and a pollen-bearing portion, called the anther. The anther contains usually two pollen-sacs, and the sterile tissue between them is often called the connective. The pollen-sacs are sporangia, and the pollen-grains are asexual spores. It was once thought that the stamen is a male organ, but it is merely a leaf modified to produce spores; in other words, it is a sporophyll (which see). The inner set of sporangial leaves is composed of the carpels, one or more of which may occur in the flower. Several carpels may unite to form one structure, or each carpel may remain distinct from the others, or there may be but one carpel. In any event the individual structure, whether made up of several carpels united together, or of separate individual carpels, is known as the pistil. This pistil usually develops in three regions: a bulbous base known as the ovary, which contains the ovules, which after fertilization become seeds; above the ovary there usually is a slender, beak-like prolongation, known as the style; and on the style there is developed the receptive structure known as the stigma, which receives the pollen. It was once supposed that the pistil is the female organ of the plant and that it contrasts with the stamen or male organ. It is now known that the carpels are sporophylls, that is, leaves set apart to produce sporangia, in this case the sporangia being the ovules.

Not all flowers possess all of these parts. For example, one of the sets of floral leaves may be absent, when the flower is said to be apetalous; both sets of floral leaves may be absent, when the flower is called naked; the stamen-set may be lacking, when the flower is said to be pistillate; the carpels may be lacking, when the flower is said to be staminate. In case the floral leaves are present, but cannot be distinguished from one another as calyx and corolla, it is common to speak of them all together as the perianth, as in the lilies. Very frequently the members of the same set may coalesce with one another; for example, the sepals may organize together to form a cup-like or tubular calyx. The petals may organize in a similar way, the corolla appearing like a bell, a trumpet, a tube etc. When sepals are thus united, the flowers are said to be gamosepalous; when the petals are united, the flowers are said to be monopetalous or gamopetalous or, best of all, sympetalous. When the filaments of the whole set of stamens are united, the stamens are said to be monadelphous. When the carpels are united, the pistil is said to be syncarpous. The word which contrasts with sympetalous, as indicating the opposite condition, is polypetalous; and the contrasting word for syncarpous is apocarpous. Another very common modification is that in which the sepals, petals and stamens seem to arise from the top of the ovary, the latter appearing outside the flower below the other parts, as in the common honeysuckle. Such a flower is said to be epigynous, and the ovary is often described as being inferior. The term for the contrasting condition is hypogynous. Flowers are often also irregular, the members of the different sets, notably the petals, not being all alike. This results in the formation of two-lipped flowers, spurred flowers etc. This condition of irregularity is known as zygomorphy, and the contrasting term applied to a regular flower is actinomorphy. The great purpose of the flower, with more or less conspicuous floral leaves, seems to be to secure pollination by means of insects. See POLLINATION. JOHN M. COULTER.

Flowers, National and State, Long years of association, give the flowers of a nation their peculiar significance. It is said the shamrock holds its place in the hearts of the Irish because good St. Patrick one day, whilst preaching, used as illustration the three little leaves in cluster. Mention of England's national emblem at once brings up the Wars of the Roses at the ending of which the Tudor rose was agreed upon as the emblem of the country. Mention France's emblem, and the lily comes to mind, the *fleur-de-lis*, which not even Napoleon could make lose its hold on the people. Scotland and the thistle have long-time association; and as loyal as the Scotchman to the thistle is the Welshman to the leek.

The national flower of the United States has not yet been agreed upon; but various states have adopted floral or plant emblems: Kansas the sunflower; California the California poppy; Georgia the Cherokee rose; Minnesota the moccasin-flower; Alabama, goldenrod; Arizona, sequoia cactus; Arkansas, apple blossom. Colorado, columbine; Connecticut, mountain laurel; Delaware, peach blossom; Idaho, syringa; Illinois, violet; Indiana, carnation; Iowa, wild rose; Kentucky, blue grass; Louisiana, magnolia; Maine, pine cone; Michigan, apple blossom; Mississippi, magnolia; Montana, bitter root; Missouri, goldenrod; Nebraska, goldenrod; New Jersey, sugar maple tree; New York, rose; North Dakota, goldenrod; Oklahoma, mistletoe; Oregon, Oregon grape; Rhode Island, violet; South Dakota, pasqueflower; Texas, bluebonnet; Utah, sago lily; Vermont, red clover; Washington, rhododendron; West Virginia, rhododendron; Wisconsin, violet.

Flowering Plants. A common name applied to the highest group of plants, now more commonly called seed-plants or spermatophytes, which see.

Flu'orspar'. A transparent or subtranslucent brittle mineral found either in crystalline or in massive form. Its chemical name is calcium fluoride CaF_2. Its color may be blue, brown, greenish, yellow, white and rarely red, but it commonly is yellowish or blue. It is found in England, Norway, Kentucky, Arizona, Illinois and Colorado. It is the chief source of fluorine and of hydrofluoric acid which is used for etching glass. Fluorspar is used in fusing certain minerals, in iron-smelting and also, when colorless, for the manufacture of lenses.

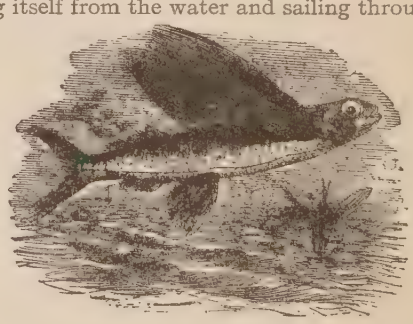
Flute, a musical wind-instrument, consisting of a tapered tube, in which the sound is produced by blowing with compressed lips into a hole near the top or wider end, which is stopped with a cork. Six holes in the lower end, closed and opened by the fingers, serve to make the musical scale. Flutes are usually made in cocoa-wood, ebonite, silver and gold. The flute is greatly used in classical music; Bach, Haydn, Handel, Mozart, Beethoven and Mendelssohn all giving it a leading part in their works. It is one of the oldest wind-instruments, having been used by the ancient Egyptians.

Flux. A flux is a substance used to make the process of melting minerals more easy. The commonest fluxes are limestone and fluorspar. A white flux is a mixture of the nitrate and carbonate of sodium or sometimes of potassium. A black flux includes carbonate of potash to remove silica and charcoal to combine with the oxygen in a metallic ore. In pottery, boracic acid, red lead and sand generally are the chief ingredients in the fluxes. A flux acts by combining with the useless matter in the ore, forming a slag in which the metal is left as free as possible, so that none may be lost in the smelting.

Fly, a two-winged insect. The word is used in compounds, as may-fly, stone-fly, butterfly etc., but when used alone is correctly applied only to two-winged insects. They belong to a natural order called *Diptera.* In the broad sense the mosquito gnat and midge are flies. The common house-fly is the best-known representative. The apple-worm is the larva of a fly. Other injurious plant-eaters are the onion-maggot and the Hessian fly. The sting of the gall-fly produces a gall on plants, in which the eggs are deposited and the larvæ reared Bat-flies infest cattle. Flies are very prolific and breed rapidly. They are useful as scavengers, and some are agents in the cross-fertilization of plants; but they also are agents in carrying germs of disease. There are about 200 species of gad-fly or horse-fly in this country. They include the strong, large flies common on wooded roads, and smaller ones, sometimes known as deer-flies, yellowish or greenish in color, a pest, annoying to both man and beast. In summer the eggs are deposited on stems and leaves, the larvæ live in earth or water. The common house-fly is found all over the world. Contrary to popular belief it does not bite, its mouth-parts not being fitted for piercing. The stable-fly, which closely resembles it, sometimes enters houses before rain and its bite is laid to the house-fly. The eggs of the latter are generally deposited in horse-manure, occasionally in decaying vegetables. They hatch in from six to eight hours into white maggots, which under favorable conditions reach full growth in four or five days. After five days of pupa stage the adult fly comes forth. In a single summer a dozen generations may appear, and when it is taken into account that one female lays an average of 120 eggs, the great numbers of the pest are readily understood.

Fly-Catchers, name of a group of perching birds, having the following characteristics: Size, small or medium; colors, dull; head large, sometimes crested; sedentary, solitary birds, never seen in flocks; not songsters, voices more or less pleasing; in obtaining food make a sudden dash after a winged insect then return to their perch; aggressive and fearless. The fly-catchers include the king-bird, wood-pewee, phœbe, Acadian flycatcher, great crested flycatcher, least flycatcher, olivesided flycatcher, yellow-bellied flycatcher and Say's flycatcher. See Blanshan: *Bird Neighbors.*

Flying-Fish, a fish capable of projecting itself from the water and sailing through



FLYING-FISH

the air. There are a number of fish, mostly in the warmer seas, that possess this power. They have large pectoral fins, that are spread as a parachute to sustain the body in the air, but are not used as wings. These fishes leave the water by the vigorous use of the tail-fin. They are rather small fishes, the largest species reaching a length

of 16 or 17 inches. Statements differ as to the distance they are able to fly. President Jordan says that the large flyingfish of southern California sometimes flies for a distance of nearly a quarter of a mile, without rising more than three or four feet. See AERONAUTICS.

Flying Squirrel. The Flying Squirrel has, connecting his fore and hind limbs, an extension of the skin of his body and this, when he leaps through the air, is stretched and holds him up. First he drops straight down, then he descends obliquely—as you see him doing here—later assumes a horizontal position, flying straight ahead, and finally turns his course upward to the branch at which he was aiming. A bird achieves the same purpose by holding his wings rigidly and assuming an oblique or vertical position (as you see the little swallow doing at the top of the picture) when he is about to light. Autumn leaves, dried, stiffened and curved by loss of moisture, are carried through the air by air currents in a similar manner. When the flying squirrel is at rest these fur "biplanes" of his which, like the rest of his fur are as fine and soft as silk, are crumpled up like the fluting on little sister's "dress-up" apron. He flies most about twilight, and it is a matter of curious interest to note that the face is much more like that of a bat (*q. v*) than that of the common squirrel (*q. v.*).

THE FLYING SQUIRREL: WHERE HE LIVES AND HOW HE FLIES

Flying squirrels are found in temperate and tropical regions all over the world with the exception of the islands of Madagascar and Australasia which you see are left unshaded. Madagascar was once a part of Africa and the Australasian islands a part of Asia, but all were separated by the sinking of the connecting land, before the days when flying squirrels were developed. See EVOLUTION.

Foch, (*fösh*) Ferdinand. The appointment of General Foch as commander-in-chief of the Allies, was, like the Battle of the Marne, one of the epoch-making events of the European War. The Allies, fighting under independent commanders against a strongly centralized power were at a disadvantage, and the series of victories for the allied arms which followed very shortly after the choice of Foch as generalissimo not only confirmed the wisdom of the act but further demonstrated the brilliant ability which had already earned for him the title, "the first strategist in Europe." The United States not only threw the weight of its prestige into the scale in favor of this step, but General Pershing placed all the American forces then in France at the disposal of General Foch. Foch and Joffre came from the same corner of France, being natives of the Pyrenees near the Spanish border. Foch was born October 2, 1851. Like Napoleon, he was first of all a student of the art of war. Later he wrote books on military science, which not only placed him among the highest authorities on strategy but led to his appointment as head of the French War College. The brilliant work done by the French army in the war was largely due to the spirit which Foch instilled into all who came into contact with him either at the college or in the field. He is described as exerting a veritable fascination. He has the characteristic French facility of conveying a whole volume of meaning by a mere gesture; and, like most great soldiers, his words are few. Caesar's "Veni, vidi, vici" is typical. It might be said of Foch, as was said of General Pershing by a newspaper correspondent who tried to interview him on a subject about which he did not think it wise to express himself, "he knows how to be silent in seventeen different languages."

Focus, a term employed in optics. If a luminous point be placed anywhere on the axis of a lens or mirror, there is in general a second point on this axis at which the rays leaving the first point will again meet or from which they will appear to diverge. This second point is said to be the *conjugate focus* of the first point. If, however, the luminous point be practically at infinity, as, for instance, in the case of a star, then the rays which are incident upon the mirror or lens will be parallel to each other. The focus at which the rays meet in this case is called the *principal focus.* Mirrors can evidently have but one principal focus; but lenses have two, since the parallel rays may be incident upon either face of the lens. If the reflected (or refracted) rays actually intersect at a point, that point is called a *real focus.*

Fog, a cloud of very small particles of water suspended in the air near the earth. Fogs appear white because the water-particles are small and transparent. The principal source of fog is a moist soil with colder air above it. Another frequent source of fog is the passage of hot moist air over cold water; as, in the early morning over rivers and small lakes. Fogs cannot form except in air in which dust-particles are present, a nucleus of some kind being required before condensation can begin.

Folk'lore, the study of the popular customs, traditions and tales of a people. The systematic study and collection of old

ballads and tales, with the recording of customs and ceremonials, began with the 19th century, though there had been some work done in this field before, as Percy's *Reliques of Ancient English Poetry;* Scott's *Minstrelsy of the Scottish Border* (1802). The *Home Stories* of the brothers Grimm (1812); Grimm's *German Mythology; Fairy Legends and Traditions of the South of Ireland* by Croker; *Popular Rhymes of Scotland* by Robert Chambers; and *Legends of the Punjab* are examples of the work already done. The Grimm brothers, who almost created this science, spent 13 years in collecting their stories from the lips of peasants. Not only have these collections been made in all countries, but folkfore societies have been formed and several folklore journals founded. The English Folklore Society, founded in 1878, has its organ, *The Folklore Journal.* There are three folklore journals published in France, and a congress of students of the subject was held in Paris in 1889. The American Folklore Society, instituted at Cambridge, Mass., early in 1888, has for its object the collection of old English folklore, the lore of negroes in the southern states, of Indian tribes, the French folklore of Canada and the Spanish folklore of Mexico and California. The study of folklore is not entirely for amusement or curiosity. By comparing the records thus collected of ancient peoples and times, much is learned of the relation of races and languages to each other, thus adding to the materials for the studies of ethnology and philology. See *Custom and Myth,* Lang; *Myth and Mythmakers,* Fiske; and *Curious Myths of the Middle Ages,* Baring-Gould.

Fol'licle, a dry pod-like fruit which splits down one side. See FRUIT.

Fond du Lac, Wis., county-seat of Fond du Lac County. Lies in a fine farming district at the head of Lake Winnebago, has three railroads and manufactures lumber, sash, doors, blinds, agricultural implements, leather, boots and shoes, caskets, tents, awnings, refrigerators, furniture, saw-mill machinery, overalls, workshirts, typewriters, tables, dustless brooms and boats. The high school, court house, opera-house, Elks' Club, Masonic Temple, St. Agnes' Hospital, Grafton Hall (girls' seminary), Y. M. C. A., armory, postoffice and a number of churches are its principal buildings. It is lighted by electricity, has extensive waterworks, 25 miles of paved streets, and is noted for the excellence and number of its artesian wells. Population 18,797. Fond du Lac is an excellent example of the development of natural resources by business enterprise.

Fontaine. See LA FONTAINE.

Fontainebleau (*fôn'tân'blō'*) a town in France, beautifully situated in the midst of a forest, near the left bank of the Seine, 37 miles southeast of Paris. It is chiefly famous for its chateau, the pleasure-palace of the kings of France. Founded by Robert the Good in the 10th century, it has been added to by almost every king of France, so that it bears the architectural style of almost every century. It was here that Pope Pius VII was detained a prisoner for nearly two years by Napoleon, and here also Napoleon signed his act of abdication in 1814. The forest surrounding the chateau covers 65 square miles. The modern city furnishes a great deal of wine and fruit for Paris, and has manufactories of porcelain. Population about 15,000.

Fontenoy (*fônt'nwâ'*), a village in Belgium, the scene of a battle on May 11, 1745, between the French, 60,000 strong, and the English, Dutch and Austrians in equal force. After a hard fight the allies were forced to retreat, the loss on each side being about 7,000 men.

Foochow or **Fuchau,** the capital of the Chinese province of Fu-chien or Fukien is situated on Min River, 25 miles from its mouth. The town proper is surrounded with walls nearly 30 feet high and 10 feet wide at the top. The trade is principally in tea, the shipments in 1897-98 amounting to nearly a million pounds sterling or close upon six million Haikwan *taëls.* The imports are opium, cotton goods and lead, whose total value in 1905 was over seven million *taëls.* It was opened to foreign commerce in 1842, and is one of the largest mission-stations in China. Lines of the imperial Chinese telegraph connect Fuchau with Shanghai, Amoy, Canton and Ningpo. Population 624,000.

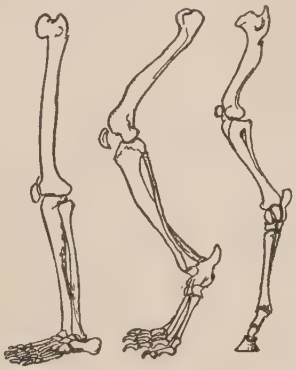
Food, that which nourishes. Foods are varied, those of the animal kingdom being vegetable and animal substances or products, together with certain mineral salts. In the broad sense water and oxygen are foods. Physiologists distinguish between foods and foodstuffs. A food is an article of diet that may be composed of one or more foodstuffs. For example, bread is a food, composed of starch, gluten, fat, water and various mineral salts, and the latter are foodstuffs. There are four main groups of foodstuffs: Starches and sugars, made of carbon, hydrogen and oxygen and called *carbohydrates;* butter, oils, fat and the like, made also of carbon, hydrogen and oxygen in different proportions and called *fats;* lean meat, white of egg etc., made of carbon, hydrogen, oxygen and nitrogen and called *proteids;* and water and mineral salts, called *inorganic foods.* Foods usually are insoluble and, when suspended in water, will not pass through a membrane. The object of digestion is to render them soluble and capable of passing in solution through membranes. This is different from assimilation, which consists of the processes by means of which the digested food is built into living tissue. Food is used to

make good the constant loss that occurs in all living beings. It stands to reason that the food, in order completely to nourish the body, must contain all the chemical elements of which that body is composed. These chemical elements are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus and various other elements in very minute quantities. It will be seen, therefore, that proteid substance in some form must be a part of the food, in order to supply nitrogen since carbohydrates and fats contain only carbon, hydrogen and oxygen. Milk and eggs are good examples of complete foods. For physiological reasons a mixed diet is best. Green plants, unlike animals, are able to make use of compounds like water and carbon-dioxide, and, by means of the energy derived from the sun's rays, build these into carbohydrates, as starch and sugars. These may be used in conjunction with nitrates to manufacture their protoplasm, which is endowed with life. The construction of starch etc. requires energy, and, by the well-known law of conservation of energy, the substances thus formed are endowed with potential energy. The agent that enables plants to utilize the energy from the sun, is their green coloring matter (chlorophyll). Animals must start with complex substances already endowed with energy, and, therefore, require carbohydrates, fats and proteids. The food is the source of energy to the animal-body. See BREAD, BUTTER, FLOUR, MILK, also PURE FOOD LAWS.

Food, of plants, consists of materials suitable to be used, without the expenditure of much work upon them, for the formation and repair of the plant-body. Foods for plants therefore are essentially the same as for animals, which is to be expected because the protoplasm is alike in the two. The food of green plants is not different from that of others, but they alone have the power to make food in the green cells under the action of light. (See PHOTOSYNTHESIS.) No other living things possess this power; hence the world is dependent on green plants for its food and for all the fuel whose energy drives its machinery. Carbon-dioxide and water are not properly called plant-food, being the material out of which some foods only are made.

Fool. See JESTER.

Foot, the part of the limb upon which an animal stands when resting. A comparison of the foot in various animals brings out many interesting modifications. The limbs are composed of corresponding parts, but there is great variation as to the development and the number of parts in contact with the earth. In the human foot we distinguish the ankle or tarsus, the instep or metatarsus and the toes or phalanges. The heel rests upon the earth, and this condition is called a plantigrade foot. Other animals, like the cat and dog, walk on the toes or digits, giving a digitigrade foot. The heel is up in the air and the instep is lifted away from the earth. In deer, cattle, horses and other animals the elevation of the heel has been carried further, and the animal stands on the tip-end of a single toe; the heel, instep and digits are away from the earth, the tip-end of one only being in contact. These points are illustrated in the diagram; in this comparison of the hind limb of man, dog and horse the heel-bone, to which is attached the tendon of Achilles, forms a landmark. It, of course, is to be understood that the fore limbs of dog and horse have undergone similar modifications. The deer, cattle and other animals have an even number of toes, while the elephant with five, the rhinoceros with three and the horse with one are odd-toed. The horse has the most remarkable example of a modified foot; not only are the heel and instep off the earth, but the bones of the instep have become reduced to one, and the animal walks upon the tip of a single toe on each foot of the four feet. It has been shown by fossils in the rocks that the horse's foot has been derived from that of an original five-toed ancestor, by suppression and consolidation of parts. The geological history of these changes extends over more than two million years. (See EVOLUTION.) The word foot is also applied in zoology to the tube-feet of starfishes, the part of the body upon which snails and clams rest, the feet of crustacea, insects, etc.



FOOT

Foot'ball, an outdoor game of several varieties, played with a round or oval, inflated ball about 27 or 28 inches in circumference. The ball consists of a rubber bladder encased in a leather cover. The game is a very old one, and now has three main varieties: association-football, which is played extensively throughout the British empire; Rugby football, which originated at Rugby School, England; and American college-football, which is a local development of the Rugby game.

A form of Rugby football was introduced at Harvard University about 1870. It was soon taken up as an intercollegiate game, the rules altered from time to time by those meeting in the intercollegiate football conventions, and the distinctively American

form of the game gradually evolved. The game is played upon a level, rectangular piece of ground 330 feet long by 160 broad. The boundary lines of this area should be plainly marked with lime or sawdust, to enable the referee to determine when and where the ball has gone out of bounds. There also are transverse lines crossing the field at intervals of every five yards, to enable the referee to determine readily how much ground has been gained by the side in possession of the ball. The end-boundary lines are called the goal-lines, and at the center of each stands a goal consisting of two upright posts 18 feet 6 inches apart, united by a crossbar at a distance of 10 feet above the ground. There are eleven men on each side, constituting a team. In general seven men play forward with the ball, and the remaining four somewhat back of them. The center-man or center-rush usually puts the ball into play Immediately behind him on either side are the right and left guards, then the right and left tackles, and behind them the right and left end men. The quarter-back has a position somewhat behind the center-rush, the two half-backs a few feet behind him and the full-back farthest back of all.

The choice of goals and first possession of the ball having been determined by lot, the play is started by the ball being kicked off from the center-line to a distance of at least ten yards into the opponents' territory. During the kick-off, the side in possession of the ball must not be beyond the center-line, and the opposing side must be at least ten yards back of it. After the kick-off, any player who is on side, that is, between the ball and his own goal, may get possession of it and run with it towards the opponents' goal or pass it to one of his own side, provided he does not pass it forward, that is, to one who is ahead of him and consequently not on side. Having the ball in the vicinity of the opponents' goal, scoring may be made either by a drop-kick, that is, by kicking the ball from the field over the cross-bar of the goal, thus securing five points, or by securing a touch-down, that is, carrying it over the end-line and touching it to the ground behind the opponents' goal-line. A touch-down counts four points, and also entitles the side securing it to a try-at-goal. In case of a try-at-goal, the ball either is kicked out to be caught by one of the same side and kicked at goal by him from a point back of that from which he caught it, or is held to the ground by one player while one of his side kicks it at the goal. In either case, if the player succeed in converting the touch-down with a goal, that is, succeed in kicking the ball over the cross-bar of the goal, it adds one point to the score of his side. Another possible way of scoring is by means of what is known as the safety. In case a team is hard-pressed by its opponents who seem likely to secure a touch-down, if the oppressed side themselves touch the ball down behind their goal, they win the privilege of taking the ball out to the twenty-five yard line and of kicking it off from there. In that case, however, the opponents win two points.

When a player is running with the ball, he may be caught and stopped by an opponent. In this case, if he keep possession of the ball and say "down," the ball is again put into play by his own side from this spot, by means of a play called a scrimmage. In the scrimmage the teams line up, facing each other, the center-man passes the ball to one of his backs who kicks it down the field or tries to carry it towards the opponents' goal, his own team meanwhile trying to protect him, as far as the rules will permit, from the attacks of the opposing side. In case the ball is kicked out of bounds, it goes to the possession of the opposite side who usually put it in play in scrimmage.

It has been found desirable to prevent one side from keeping possession of the ball indefinitely by means of scrimmage-play, without making progress with it towards the opponents' goal. This is accomplished by means of a rule that if in three attempts the ball is not advanced by at least ten yards, it must either be taken back twenty yards or given over to the opponents. Consequently if, after two scrimmages, it seem unlikely that the required ten yards will be gained, the ball is usually kicked as far as possible down the field.

The game has developed into one affording considerable opportunity for the display of generalship on the part of its principal director and for a great variety of team-plays and tactics. The quarter-back and the captain generally use a code of signals to inform their men what particular plays to execute. The game has recently been severely criticised on account of its roughness, and new rules changing the nature of the play have consequently been introduced.

Association-football is older than either Rugby or American football, and is still popular enough in England to draw crowds of 100,000 people to its most important matches. The ball used is round instead of oval, it is played almost entirely by kicking it, the players not being allowed to carry it as in the other games, and a score is secured by sending it between the goal-posts of the opposing team, under the cross-bar. The posts are twenty-four feet apart, the cross-bar eight feet high. The players consist of one goal-keeper who alone is allowed to touch the ball with his

hands, two backs, three half-backs and five forwards.

Foote, Andrew Hull, an American naval officer, was born at New Haven, Conn., in 1806. He entered the navy in 1822, and was appointed captain in 1849. In 1856 he carried by storm four forts at Canton, China. On the outbreak of the Civil War he organized and equipped the western flotilla, and in February, 1862, stormed Fort Henry. His services obtained for him the rank of rear-admiral and a vote of thanks from Congress. He died at New York on June 26, 1863. See his *Life* by Prof. James Hoppin.

Foote, Mary Hallock, American novelist and artist, was born at Milton, N. Y., on Nov 19, 1847, and lived for some years in Colorado, Idaho and California. She then studied art in New York, and did much work in black-and-white for magazines and book-illustrations. Her residence in the west seems to have impressed Mrs. Foote, and led her to attempt the delineation in fiction of frontier and mining life, and of scenes steeped in local color, characteristic of the west. Her success has been great, especially in such stories as *The Led-Horse Claim; John Bodewin's Testimony; Cœur d'Alène;* and *The Chosen Valley.* Other romances and novels include *In Exile and Other Stories, The Cup of Trembling, A Story of a Dry Season, The Last Assembly Ball, The Desert, The Sower, A Touch of the Sun* and other stories.

MARY HALLOCK FOOTE

Forage-Crops. See FEEDING-STUFFS.

For'aker, Joseph Benson, United States senator and jurist, was born near Rainsboro, O., on July 5, 1846. When the Civil War broke out, he enlisted in an Ohio regiment and served throughout the struggle, gaining the rank of first lieutenant and brevet-captain. In 1869 he graduated at Cornell University (N. Y.), and, being admitted to the bar, practiced law at Cincinnati and was elected judge of the Cincinnati superior court. Resigning in 1882, from ill-health, he became active in politics, and from 1886 to 1890 was Republican governor of Ohio. In 1896 and in 1902 he was elected to the United States senate, where his ability as a debator and constitutional lawyer gave him prominent rank. He died in 1917.

Forbes-Robertson, Sir Johnston, one of the most distinguished actors of his day, was born in London, England, in 1853. Originally trained to be an artist, he went on the stage at 21. He was at one time a member of Sir Henry Irving's company, and also was leading man to Mrs. Patrick Campbell. In later years he starred in *Hamlet, Macbeth, The Passing of the Third Floor Back,* and *The Light That Failed.*

Force, in physics, always means the product of *the mass of a body* and *the acceleration of the body.* If we denote the mass of a body by m and its acceleration by a, then the force F, which is acting upon the body, is given by the following defining equation:

$$F = ma.$$

Strictly equivalent to the preceding definition are the following two: *Force is the time-rate at which the momentum of a body is changing;* and *Force is the space-rate at which the energy of a body is changing.* Sometimes force is assigned an objective existence, and is spoken of as the *agent* which changes the momentum of a body. But, so far as is known, the only things in nature which have an objective existence are *matter* and *energy.* The physicist, therefore, prefers to use force merely as a measure of a certain ratio, namely, the rate at which momentum changes in the time. It is important for the student to observe that the momentum of a body may be changing even while the body is at rest, as is the case with a pendulum-bob at the end of its swing. In like manner a body may be in rapid motion and be acted upon by no force, as is the case with a pendulum-bob when passing through its lowest point.

Moment of force is a quantity which plays the same rôle in rotation that force plays in translation, and it is defined in a strictly analogous manner. Moment of force acting upon any body is measured by the product of the *moment of inertia of the body* and the *angular acceleration* of the body. Or, what is the same thing, moment of force is the time-rate of change of the angular momentum of the body. Or, still again, moment of force is the angular rate at which the energy of the body is changing. For *unit of force* see DYNE and DYNAMICS.

Ford, Henry, American inventor and manufacturer, without question the most famous maker of automobiles in the world. He was born in Greenfield, Mich., in 1863, attented the district school, and became a machinist. About 1896 he began to experiment with horseless carriages operated by steam, and in 1895 he built the first gasoline "Ford." The Ford Motor Company, which he organized in 1903, rapidly reached a point where it made more automobiles than any other company in the world. By standardizing the design and developing large-scale production, it was possible to reduce the price and place it within the reach of millions who could not afford higher-priced automobiles.

Ford's ideas on economics and politics drew almost as much public attention as the fact that he was the only rival of John D. Rockefeller for the position of the world's richest man. The high wages paid in his plant, his financing of the "peace ship" in 1915, the radical policies supported in his weekly paper, *The Dearborn Independent*, his contest with Truman Newberry for the senatorship from Michigan in 1920, called upon him a mixed shower of praise and ridicule.

For'est. Forests may be considered as the climax of the world's vegetation, but conditions favoring their development do not exist everywhere. There are many types characteristic of different regions. The prevailing type of temperate regions is the deciduous forest. Sometimes it is nearly pure, as in beech-forests, oak-forests, etc.; but the more common type in the United States is the mixed forest, consisting of a mingling of numerous trees, as maple, elm, hickory, oak, beech, walnut, poplar, gum, etc. The deciduous forests of the United States are much finer than those of Europe, where the varieties are not so numerous and the trees are not so well-developed. Coniferous or evergreen forests are common in mountain regions and on sterile soils, extensive forests of this kind occurring in the lake-states, gulf-states and in the western mountains. The greatest of all forests are in the rainy tropics, as in the Amazon region, where the forests form jungles dripping with moisture, the trees being interlaced with vines and covered with air-plants. The scientific handling of forests is called forestry, (see FOREST-SERVICE) which involves not so much the preservation of forests, as proper care and cutting, by means of which they may be preserved and still yield the timber necessary for the world's use. A division of forestry has been organized by the Department of Agriculture in Washington, which has charge of this subject in the United States. Foreign countries, as France and Germany, are far in advance of the United States in the proper management of forests.

Forest-Reserves are areas reserved for the preservation of forests and the protection of other natural resources. They are withdrawn from occupation, except conditionally. The national reserves are called national forests, and number 160 in the United States, including four in Alaska and one in Porto Rico. There are four state-forests.

The law as to national forests encourages every industry that will not jeopardize their safety and maintenance. Each is subject only to restrictions that prevent waste and injury to the forests. Any settler can obtain $20 worth of timber a year for home-purposes free. The forester marks the trees, and the pioneer cuts them. Should the settler need more than $20 worth, he files an application, and in 1911 over 40,000 such free-use permits were issued. Only mature trees may be cut. They must be so cut as not to hurt young growth. Tops and brush must, if necessary, be burned. Cutting must begin within six months from the date of the permit, and be completed within a specified time. For municipal and mining purposes the government grants rights of way. It also issues grazing permits; lets cattle be driven through the forests between pastures outside; and builds driveways for stock in reserves where grazing is not allowed.

Location and Acreage of National Forests.

Arizona	13,883,452
Arkansas	1,184,012
California	21,104,069
Colorado	13,408,138
Florida	318,960
Idaho	18,139,435
Kansas	156,376
Michigan	84,011
Minnesota	844,473
Montana	16,192,504
Nebraska	521,065
Nevada	5,424,254
New Mexico	9,810,522
North Dakota	6,224
Oklahoma	61,028
Oregon	13,740,139
South Dakota	1,073,760
Utah	7,201,695
Washington	9,914,314
Wyoming	8,420,497
Total	141,488,928
Alaska	26,643,260
Porto Rico	32,975
Grand Total	168,165 163

California has the largest, North Dakota the smallest, national forests. The New York reserves are mainly in the Adirondacks, but partly in the Catskills; the Pennsylvania ones at the heads of its three principal rivers.

Forest-Service is a branch of the Department of Agriculture that cares for the national forests and also promotes forestry throughout the country, forestry being the art of growing forests and keeping them up. The service originated in 1897 when Mr. Cleveland was president, and until Feb. 1, 1905, was under the Department of the Interior. It comprises the office of the forester and four branches. These are operation, silviculture, grazing and products. The forester's office includes inspection, law, information and dendrology, the science that deals with the natural history or life-story of a tree. Operation includes maintenance, accounts, organization, engineering and lands. Silviculture includes extension, silvics and management, silvics being the science that treats of a forest. Grazing includes control and development. Products include wood-utilization, wood-preservation and publication. The forester is Henry S. Graves, and his force in 1911 numbered 2,624 men. Positions are filled by civil service examinations, and technical qualifications of a high order are required

The work was begun because our forests are disappearing so rapidly that it is calculated that they will be exhausted within 20 years. Another reason for trying to save them is that the water-supply and the soil depend on the forests. Where forests abound, the rain falls often and is kept a long while by the forest-soil, which is a kind of sponge, so that the streams have a steady supply and the flow and depth are regular. Where forests have been destroyed, the rain falls irregularly and flows away in floods at once. These cause great loss, and carry the soil away. This is called erosion, and a billion tons of fertile earth are taken to the sea every year by our rivers, while these themselves remain shallow and fill with stones and sand. So the saving of the water, on which agriculture, irrigation, the making of electricity, inland navigation, mining and even manufacturing all so largely depend, is a chief aim of the forest-service, as well as the preservation of a permanent supply of timber.

Already efficient protection for forests has increased the flow of their streams 25 *per cent.* Grazing lands, in the national forests, that had been almost ruined have begun to recover. Fire, the forest's worst foe, is so successfully fought that in 1907 only one eight-hundredth of the forest reserves had a fire, though their area is over 158,000,000 acres, and only three ten-thousandths were destroyed. At the same time new kinds of timber are being brought into use, with new ways of using and preserving old kinds, and the states and the private owners of forests are assisted in many ways.

Forge, a fire intensified by air-blasts. Forges formerly were generally made of bricks, the air being forced up beneath the fire by means of a bellows. They now are made of wrought or cast iron, and may be moved about from place to place. In former times forging was one of the most important arts in engineering and required expert workmen, but the steam-hammer and other like inventions of the present day have made forging a mechanical work. One of the largest forging machines in the world makes 600 to 1,200 strokes a minute.

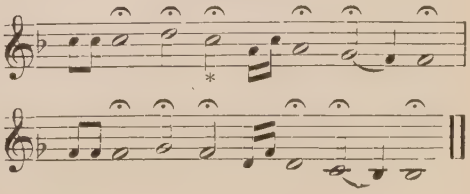
Forget-Me-Not, a term applied to a flower of which there are many species, and accounted for by various legends. The flowers in the common forget-me-not are small, have five petals and are of a medium shade of blue.

Form, in music, a term of as wide application and significance in music as in philosophy. From a very common use forms of music may be classified according: (1) to the character of the tonal embodiment or mode of expression, *i. e.*, vocal and instrumental, choral and orchestral; (2) function in social and religious life of peoples, *i. e.*, secular, ecclesiastical, religious; (3) inner character or nature of the subject defined, *i. e.* lyric, dramatic, programatic; (4) structural ordering, *i. e.*, contrapuntal, polyphonic, monophonic, binary, ternary, first-movement, rondo, cyclical; (5) melodic material, *i. e.*, monodic — one primary melody with various modes of accompaniment; polyodic — each accompanying melody having a true and characteristic melodic significance, for example, Chopin's *Étude in C-sharp minor*; monothetic — one theme, treated in various ways in all the voices, as in the canonic and fugal forms; polythetic — more than one theme, as in the double and triple fugue, the suite, sonata, etc. Each of these classes contains a variety of individual forms, *i. e.*, vocal includes many types of song, the chorus, oratorio, part-song, madrigal, glee, etc. Under ecclesiastical heading are to be classed the hymn-tune, choral, mass, liturgical forms like the Gregorian tones, chants, responses, etc. and Bach cantatas.

Strictly speaking, form applies to two distinct aspects of musical conception; first, to the anatomical or architectural ordering of the rhythmic, harmonic and melodic content; second, to the plastic, the æsthetic molding of the tonal expression of the melodic and harmonic ideas through the application of rhythmic nuances, dynamic intensities, shadings and accents, modes of articulation and the wonderful varieties of tone-color. Hold a leaf to the light and look *through* it, and there is seen a very complex system of the individual elements of ribs, veins, cellular tissues, etc. in characteristic relations; that is the structural, architectural design, form and unity of the leaf appealing to the intellect. Look again *at* the leaf and note the beauty of its rhythmic outline and symmetry, the warmth of its coloring and the delicacy of its aroma; that is the plastic, the æsthetic, the vital form reaching the heart. No work of art is of value that does not involve both these conceptions of form, and he only is an artist who, in conception and expression, realizes the beauties both of the structural and the æsthetic form of a work of art, be the art what it may — in this case, music.

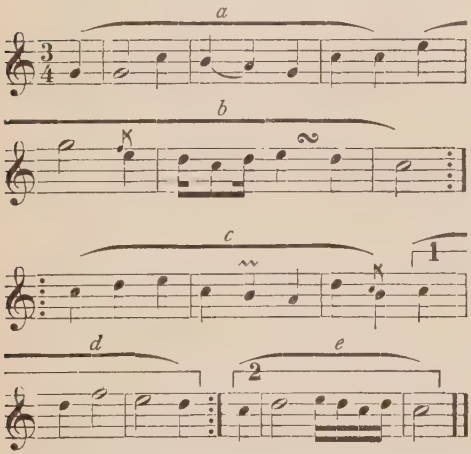
A few simple melodies will suffice to illustrate the primary elements of structural form in music. We will begin with the tribal prayer of the Omaha Indians.

EXAMPLE 1



In this most tenderly beautiful choral we have the first simple melodic unity. Two melodic ideas, *a*, *b*, called phrases, are made clearly apparent through harmonic and melodic progression. The first cadence at * involves the definite conception not only of progression but of necessity for a succeeding phrase, expressing a definite relation — in this case, a sense of antithesis. The two phrases stand, therefore, in the relation of thesis and antithesis, and the unital idea may be called a strain. Strain, therefore is a primary form — a *norm*, used in the structural development of music; just as the unity of subject and predicate, called a sentence, whether represented by single words or phrases, is a structural element of poetry; and the arch, a structural element of architecture. In the following old French song, *Gabrielle Charmante*, the phrases *c*

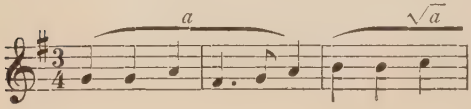
Example 2

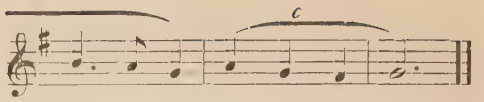


and *d* constitute a strain of a somewhat different character from the strains *a* and *b*. The second phrase (*d*), because of cadential treatment, expresses this idea of a complementary rather than an antithetical phrase to *c*. Phrases *c* and *e* are decidedly thetical and antithetical, as also phrases *a* and *b*. The strain, therefore, may be in two forms, according to whether the two terms (phrases) are relatively thesis and antithesis or thesis and complement.

Each of these terms, thesis or antithesis, may be strengthened by some form of reiteration, one illustration of which is found in the first strain of *My Country, 'tis of Thee*.

Example 3

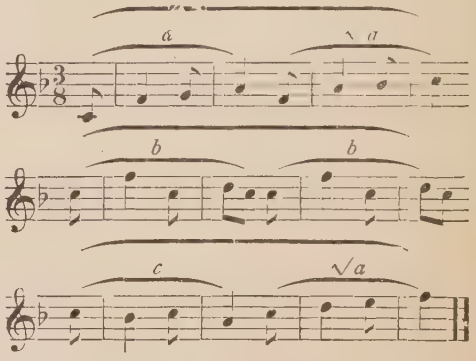




The thetical feeling of phrase *a* is strengthened by phrase √*a* not so much by the likeness in melodic design as by the rhythmic and especially by the cadential reiteration. This strengthening of the thetical element of the strain is quite common. The reiteration of the antithesis also occurs, but more rarely.

A very different form of two-phrase structure is illustrated in the following old folksong:

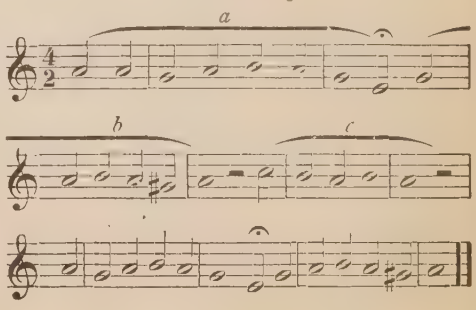
Example 4



Phrase √*a* is clearly a modified form of *a*, and closes with a like cadence. The two phrases, however, constitute a distinct unity, the second phrase not being a mere repetition. Such a two-phrase structure may be termed a couplet. A couplet involves a thesis and some modified form or intensive reiteration of the thesis, with definite cadential relations. Like the strain, the couplet is an elementary unit of thought — a norm. Unlike the strain, the couplet always is a dependent idea, while the strain may be dependent or constitute a completely independent melodic idea as in Example 1.

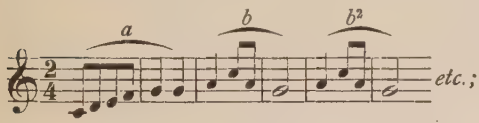
Another unit of thought — a norm — is illustrated in the following old German choral:

Example 5



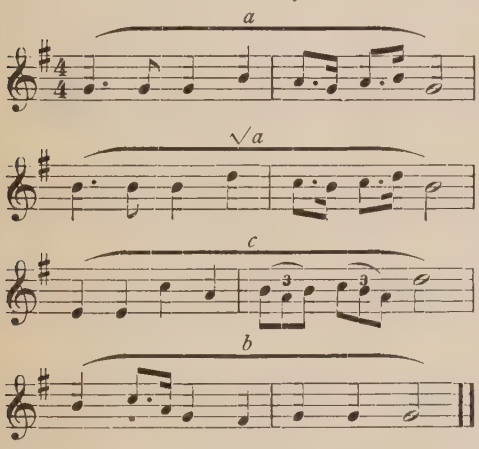
In this example a single phrase is used as a distinct unit of thought, standing in somewhat the relation to the preceding *a b*, and succeeding a^2, b^2, strains, that the second couplet, *b b*, in Example 4, sustains to the couplet *a a* and strain *c a*, between which it stands. In the following old folk-song the phrase as a distinct unit of thought is used in the form of an echo:

EXAMPLE 6



and in the chorus of *Hail Columbia*

EXAMPLE 7



it is used to build up a complete stanza-form. It is also to be met with as a kind of parenthetic interpolation and as a refrain. The strain, couplet and phrase, then, are the primary units of thought involved in all the large structural and æsthetic forms of music.

In a simple way we see how the melody of Example 1 is a compound idea, for the second strain is not a repetition, but an æsthetic development, a more intense, more deeply solemn utterance of the spiritual significance of the prayer. This greater impressiveness is the result of the relation in tonality of the two strains and the tone-stratum in which the second strain is sung. The first strain is clearly in the dominant key, and the second in the tonic. This is a specimen of a rare type of what is called binary form, to be found, so far as the writer is at present aware, only in very simple primitive folk-songs like the above. A second more common type of binary form is illustrated by Example 2, when the second part is developed out of new melodic material. The most common type of the binary form, however, is where the second strain, stanza or strophe introduces new melodic material in relation with that derived from the first part. This is frequent in two-strain folk-songs and the simpler folk-dances, especially in their idealized forms, *i. e.*, Bach's minuets, written for children.

In Example 4 are to be discerned three distinct parts, the third of which is a repetition of the first. This is termed the ternary (three-part) form. This type of structural design is probably more commonly followed than any other. If space permitted, it could be shown that, in general, this design is the essential basis of well-developed fugues, dances of all kinds, the so-called first-movement form, the rondo, the finale and the aria.

It remains to point out one more highly significant form, illustrated in a most elementary way by Examples 7 and 5. In this form the ideas (in Example 7 phrase-units, and in Example 5 couplet and strain-units of thought) follow one another with ever-increasing intensity of interest and spiritual force, embodying, like the sonnet, that poetic form which it most closely resembles, the innermost "holy matters" of the heart, such as may appear only in "a letter [song] from the poet [singer] marked 'confidential.'" Bach's first Preludein *The Well-Tempered Clavier* is a most simple but wonderfully significant and beautiful specimen. C. B. CADY.

Formo'sa or **Taiwan,** an island, now belonging to Japan, lying off the coast of China, having a length of 235 miles and a breadth of from 70 to 90 miles. Its area is 13,458 square miles. The highest mountain is Mount Morrison, 12,487 feet high. The island is famous for its vegetation, many of our rarest hot-house plants growing wild on its mountain-sides and in the valleys. Camphor and teak-trees, pines, firs, bananas, bamboos and palms are there in profusion. There are 43 species of birds peculiar to the island, and fish are plentiful along the coast. The principal products of commerce are tea, sugar, coal, camphor, rice, sweet potatoes, bamboos and rattan. The island was ceded by China to Japan in 1895. Taiwan, which is a treaty-port, is the capital (population 50,000); and the other chief towns are Tamsui and Kelung. The population of the island is estimated to be about 3,392,063, including about 50,000 Japanese. Its commerce is now largely with Japan, though there still is considerable trade with China, as also with the United States. There are 230 miles of railway, besides 125 miles of a light railway line; there is also a telegraph service with 88 offices open and over 1,100 miles of line. Its mineral resources are being developed, including gold,

silver, coal, petroleum and sulphur. In 1905 the exports amounted in value to 60 million *yen* (the *yen* having a value of about 50 c.); while there was a like volume and value of imports. The Japanese administration has effected much improvement in the way of sewerage, water-works, the establishment of hospitals and schools, as well as manufactures. The camphor-industry, together with the fisheries, has been extended, in addition to its agricultural interests. See Guillemand's *Cruise of the Marchesi.*

For'rest, Edwin, a celebrated actor, was born at Philadelphia March 9, 1806. He first appeared on the stage in 1820, and at 20 played as Othello in New York. He appeared with success in London in 1836 and 1837, but injured his reputation there by hissing Macready. He made his last appearance in the part of Richelieu at the Globe theater, Boston, in 1871, and died of paralysis on Dec. 12, 1872. His acting of Lear, Othello and Coriolanus was greatly admired. With him the line of great American actors began. See *Life* by the Rev. W. R. Alger.

EDWIN FORREST

Forrest, Nathan Bedford, a Confederate general, was born in Bedford County, Tenn., on July 13, 1821. He raised a cavalry regiment at the outbreak of the Civil War, and was engaged in the battle of Shiloh. He was an able and daring cavalry leader, commanded the cavalry at Chattanooga and fought at Chickamauga. In April, 1864, he captured Fort Pillow; was promoted to be lieutenant-general in 1865; and surrendered at Gainesvillen on May 9 of the same year. Forrest died at Memphis, Tenn., Oct 29, 1877.

Forrest, Sir John, LL. D., explorer and administrator, was born in Western Australia on Aug. 22, 1847. Entering the surveying department in 1864, he was assigned the command of the expedition which went in search of Dr. Leichhardt in 1869. The following year he commanded the expedition from Perth to Adelaide along the shores of the Great Australian Bight. In 1874 he headed the 2,000-mile journey without camels from Champion Bay to the overland telegraph line between Adelaide and Port Darwin through the center of Australia. For this achievement he received a substantial reward from the government and the gold medal of the Royal Geographical Society. Sir John was the first premier and treasurer of West Australia under responsible government, leaving this office to become minister of defence of the Commonwealth of Australia (1901-1903), then taking the ministry of state for home affairs, which he held until 1904. He was responsible for the building of the great harbor at Freemantle and for the water-supply for the Coolgardie gold fields. He has published *Explorations in Australia* (1876) and *Notes on Western Australia* (1884 to 1887).

For'ster, William Edward, an English Liberal statesman, was born in Dorsetshire on July 11, 1818, and died at London on April 5, 1886. He was of Quaker ancestry, and was educated at the Friends' school in Tottenham. Settling at Bradford, he engaged in the manufacture of woolens, in which he made a large fortune. In 1861 he entered Parliament and took an active interest in education; was vice-president of the council of education; and carried through the elementary educational bill of 1870 and the ballot-law under the Gladstone administration. In 1874 he visited the United States, and on his return was elected lord-rector of Aberdeen University. In 1880 he became chief secretary for Ireland in Mr. Gladstone's cabinet, and sought to grapple with Irish affairs; but, owing to disagreements with his chief on his leniency toward Parnell and the Land-Leaguers, whom he sought to coerce by drastic legislation, he resigned, and thereafter was at issue with Gladstone over his Irish policy. He was held in high esteem in Parliament for his honesty and independence of character, though from Irish partisans he earned the title of Buckshot Forster from the severity of his views in respect of Irish sedition.

Fort Dodge, Iowa, county-seat of Webster County, on the Des Moines River, 90 miles northwest of Des Moines. Railroad connections are furnished by the Chicago Great Western, Illinois Central, Minneapolis & St. Louis, and the Fort Dodge, Des Moines & Southern, an electric line. It has good schools, churches, two colleges, and a Catholic Seminary. Its industries include one of the largest oatmeal-mills in the United States, coal-mines, gypsum-quarries, and clay industries. A former fort here was called Fort Clarke. Population, 19,310.

Fort Don'elson, an historic post in Tennessee, on Cumberland River, 12 miles east of Fort Henry. It was strongly fortified by the Confederates during the Civil War, and in 1862, when held by General Floyd with 15,000 troops, was attacked by Commodore Foote, who was driven back. But the forces of General Grant, coming up from the capture of Fort Henry, defeated the Confederate force, which came out of the fort to meet them. General Floyd and a part of his force escaped dur-

ing the night, and the following day General Buckner, who was next in command, surrendered with about 14,000 men.

Fort Fisher, Battle of. In December of 1864 General Grant sent an expedition against Fort Fisher, which commanded the entrance to Cape Fear River, below Wilmington, North Carolina. The force consisted of 6,000 troops under General B. F. Butler and a fleet of ironclads under Admiral Porter. After a bombardment, which continued for two days, an assault was attempted on Dec. 24, but was abandoned without serious fighting, the works being deemed impregnable. General Grant was dissatisfied with the result, and two weeks later sent General Alfred H. Terry with 8,000 men and a fleet, as before, under Admiral Porter to renew the attempt. Under cover of a bombardment by the fleet, the troops were landed on Jan. 13. The next day the works were stormed, and after a desperate and bloody hand-to-hand struggle, they were carried. Two thousand prisoners and 169 heavy guns were captured.

Fort Francis is on Rainy River, one mile from Rainy Lake (Ontario), and on the main line of the Canadian Northern. It is the Canadian terminus of the Duluth and Rainy Lake and Minnesota and International railways. It also is the terminus of the Rainy River Navigation Company. There is a fine waterpower at this point (Alberton Falls) where 30,000 H. P. are being developed.

Fort Henry. See FORT DONELSON.

Fort Madison, county-seat of Lee County, Iowa, is 18 miles from Burlington. In 1832 the town was established and took the name of the fort built there in 1808. Chief among its manufactures are agricultural implements, automobile tires and shoes; the city also has flour and lumber-mills, railroad-shops and pork-packing establishments. It is served by the Atchison, Topeka and Santa Fe and the Chicago, Burlington and Quincy. Population, 9,890.

Fort Moultrie is on Sullivan's Island, situated at the entrance to Charleston harbor, South Carolina. It was first built of palmetto-logs and earth, mounting 26 guns, and was unsuccessfully attacked by a British fleet of nine vesesls, mounting 270 guns, in 1776. It was afterward rebuilt in masonry. In the Civil War it fell into the hands of the Confederates, when Major Anderson abandoned it for Fort Sumter in December of 1860.

Fortress Monroe, a fort built on Old Point Comfort, Virginia, to defend Hampton Roads and the approach to Norfolk. It has within it detached buildings for officers' quarters, barracks, storehouses, arsenal, workshops, the artillery school etc. It can mount 187 guns. The fortress is six-sided, and is surrounded by a wet ditch, outside of which are batteries. It covers 80 acres, and cost $2,818,000. It is the largest fort in the United States.

Fort Scott, Kan., the capital of Bourbon County, on Marmaton River in southeastern Kansas, 96 miles south of Kansas City, is the center of a region rich in bituminous coal, cement-rock deposits and extensive flagstone-quarries. The chief revenue is derived from its two railroad-shops, which employ more than 1,000 hands. Besides, there are manufactories of brick, machinery and syrup. Fort Scott is the largest horse and mule-market of the state. The buildings, chiefly those of the national and county governments, are substantial and commodious, and the city is attractively situated. For some reason, however, its population has not grown in the past decade: it now numbers 10,463 inhabitants.

Fort Smith, Ark., a city on the Arkansas River, on the western confines of the state and adjoining Oklahoma. Here is a United States military reservation devoted to educational purposes, and the city school system consists of nine schools with 85 teachers and 3,500 pupils. It lies 160 miles northwest of Little Rock, and is the seat of the United States district-court of the western district of Arkansas. Its factories include mills, iron-foundries, machine-shops, furniture and wagon-factories etc. It is served by seven railway-systems. Population 23,975.

Fort Sumter, a fort built on an island near the entrance to the harbor of Charleston, S. C. When fully equipped, it was to have 140 guns in three tiers; but at the close of 1860 it had not been finished. In December of that year Major Robert Anderson, who was in command, transferred the garrison of Fort Moultrie, only 109 men, to the new fort, on learning that he was unsafe from attack in the old fort. He could mount only 52 light guns. From January to April, 1861, the fort was, in fact, besieged, as President Buchanan had refused to hand over the South Carolina forts to the state government. On April 11 the South Carolinians demanded the surrender of Sumter; and, on this being refused, notice was given that the bombardment would commence at four o'clock the next morning. The fort was seriously damaged by the firing from the shore, which lasted for several hours, but no one was hurt. As provisions and ammunition had given out, Anderson agreed to abandon the works, which he did on April 14. The firing on Fort Sumter was the beginning of the Civil War. The works were stubbornly held by the Confederates till Charleston itself was abandoned in February, 1865, and during the war they were the city's chief defense. The fort was, however, bombarded by a Federal monitor fleet, and later by batteries on Morris Island, and shot into a shapeless ruin.

Fort Wayne, the county-seat of Allen County, in northeastern Indiana, is 148 miles southeast of Chicago. It is situated at the head of Maumee River, covers nearly 19 square miles, and is the second city of Indiana in population. It is an important steam and interurban railway-center, has a large number of manufactures, including knitting-mills, car-wheel and machine-shops, agricultural implements and electrical apparatus, oil tanks and pumps, shirt waist and glove factories, steam-engine works, etc. It has fine public buildings, many school-buildings and churches, and is the seat of a Catholic bishopric. Concordia College, a flourishing institution of the German Lutheran church, is located in Fort Wayne. Its population in 1900 was 45,115, and it has a present population of 82,250.

Fort William, situated on the north shore of Lake Superior, is four hundred and twenty-seven miles east of Winnipeg, at the mouth of Kaministiquia River. The river affords a natural harbor where vessels drawing twenty feet of water can sail for five miles, and both of its banks can be used for manufacturing sites. The city's population is about 10,000. It is the lake terminus of the Canadian Pacific and of the Grand Trunk. It also is on the Canadian Northern. The whole northwest is dependent on Fort William for the outlet of its products. Its growth is rapid and safe. Large sums are being spent by the government for improving its harbor, to better the facilities for handling the ever increasing business of the Canadian marine. The Olgilvie Flour-Mills Co., the Canadian Iron and Foundry Co. and other large industrial concerns are located here. The amount of merchandise brought into Fort William by vessel for transshipment is immense.

Fort Worth, a city and important railroad center in northern Texas, county-seat of Tarrant County, lies where the West and Clear Forks of Trinity River flow together, about 170 miles north of Austin. It is, next to Dallas, the most important railroad-center in northern Texas, and is the greatest horse and mule-market of the southwest. The country surrounding it is a rich farming region, producing cotton, grain and fruits. The water-supply is obtained from Clear River and two hundred artesian wells. In 1907 it had 60 miles of electric railways. The court-house, city-hall, chamber of commerce and high-school buildings are noteworthy, as are also several of the churches. The swimming-school, costing $70,000, is one of the institutions of the city. Besides large stock-yards and meat-packing establishments, here are the car-works and shops of the Fort Worth and Denver, Texas Pacific and Rio Grande railroads. The Roman Catholics have an academy, and Fort Worth University is located here, as is also a Polytechnic College. The city possesses an excellent public-school system, several business colleges and a medical school. There are rolling-mills, iron-foundries, a jute-factory, a woven-wire factory and manufactories of flour, cotton and woolen goods, leather etc. There was but one house within the city-limits in 1872; the number of its inhabitants in 1876 was only a little over 1,000. The population, which in 1900 was 26,688, is at present 73,312.

Forth, a river and firth of Scotland. The river is formed by two head-streams, the Duchray and the Dhu, rising within a mile of Aberfoyle and not far from Ben Lomond. The Firth of Forth extends 51 miles eastward from Alloa to the German Ocean. Its waters are from three to thirty-seven fathoms deep. In 1882–89 a great railway bridge was built across the firth at Queensferry, being one and a quarter miles in length.

For'tifica'tion is the military art of strengthening a place against the attack of troops. There are two branches, called field and permanent fortification. Field-fortification includes such slight intrenchments and field-defenses as can be thrown up by the troops themselves during the few hours before a battle, as well as fieldworks requiring days or weeks to build. Permanent fortification deals with engineering works for the defense of points of importance. Years may be spent in finishing them, and iron and masonry are largely used in building them. Field-fortification, while aiming at giving the defenders of a chosen position all the advantages of cover from the enemy's fire and of forcing him to advance over open ground swept by their fire, must also allow free movement for counter-charges. A position is made ready for attack by loopholing any buildings, which may stand on it, and the walls around them, strengthening the cover afforded by ditches and hedges along the front or by throwing up breastworks and digging rifle-pits, with deep trenches in the rear for supports and gun-pits for artillery. Parts of this line should be so placed as to flank an attack on the front, and no cover should be left for the enemy during his advance. Hollows, which cannot be seen from the front, should be filled with brushwood. To oppose the advance of the enemy an abattis is often used. This is a row of tree-branches, sharpened and laid with points outward. Entanglements are also used; either of brushwood cut halfway through and woven together with wire run through it or of several lines of barbed wire fastened to stakes. Only the more important points of such a position are really fortified by building field-redoubts, usually in the form of a square, forming strong points in the main line, advanced posts in its front or a

second line of works in the rear. Often redoubts have only two sides meeting at a point in front; or they may be five-sided —two in front called the faces, two on the flanks and in the rear a lower side called the gorge. The faces and flanks are formed by parapets (meaning "guard the breast"), twelve to sixteen feet thick, to resist artillery. The gorge is shut in usually by a light parapet, say three feet thick, or by a stockade (a wall of bullet-proof timber). In building a redoubt a ditch is made in front. Sometimes sharp palings, called palisades, are planted in the bottom. The top or crest of the parapet is never more than twelve feet above the ground in a field-redoubt. Fieldworks of this kind can be built in from eighteen to twenty-four hours, and are able to withstand the fire of field-guns. Blockhouses are now only used in mountain-warfare, where artillery could not be used and timber is plentiful.

Permanent fortification, for the defense of cities, harbors, tracts of country, bridges, roads and the like goes back to the earliest times. Its aim formerly was to keep out the enemy, unaccompanied by counter-attacks, except sorties to destroy siege-works and batteries. Since 1859 detached works and free maneuvering ground between them for counter-attack have been used for permanent works as well as for field-intrenchments. This is due to the great improvement in artillery and small arms, cannon easily destroying the strongest works at long range and the breech-loading rifle increasing the power of armies in the open field.

In Greek history we read of cities surrounded with walls of brick, stone and rubble. Babylon had a wall of enormous length, 100 feet high and 32 feet thick, surmounted by towers. Jerusalem at the time of Vespasian's siege had like walls. But the square and round towers which had been defense enough against arrows, and the walls which had withstood battering rams, were soon found to be useless against cannon. Early in the 15th century the Italians began to flank their walls with bastions (built like the outer faces of a redoubt). This form of defense was carried to great perfection by the great Vauban, the engineer of Louis XIV. He built 33 new fortresses, improved over one hundred and himself carried on more than fifty sieges. Vauban's forts were in the shape of a polygon. The main body of the place is called the enceinte. Bastions are built out, and joined by a parapet called a curtain. A rampart is formed of the earth dug from the ditch, and a parapet is built on it. To protect the flanks an outwork on the far side of the main ditch is built, called the ravelin. As cannon became more powerful, the masonry had to be covered by what are called counter-guards. The enceinte or main fortification at Antwerp was fortifications at Antwerp also showed how the science had changed, outworks close to

The quick penetration by the German siege guns of the walls of Antwerp, which represented the best modern construction in this form of defense, was a revelation. It demonstrated that fortifications built at enormous expense are less effective for purposes of defense than the ditches and improvised works used wherever long lines were stretched across country.

It had not previously been regarded as practicable to transport field use guns of such enormous caliber. These guns were transported in sections and put together and mounted on solid concrete foundation before being brought into action.

In a similar way the use of the aeroplane in military operations did away entirely with the old strategy of surprise; a strategy as old as war itself, and in which Napoleon achieved such extraordinary triumphs.

A seaport or dockyard must be fortified in a different way from an inland town, as the heaviest guns can be brought against it by the enemy's ships, and it can now be bombarded at a distance of ten or more miles. The first line of defense is made of submarine mines. To protect these, shore batteries are thrown up, able to drive back a landing party. Electric lights to discover the position of the enemy, guard-boats, swift steamers to scout in front and torpedo-boats are necessary. For the real defense the heaviest guns to be had are mounted. See *Military Engineering* by Prof. D. H. Mahan.

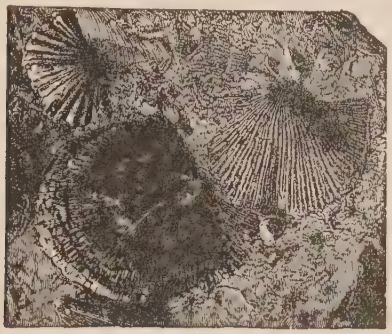
Fortu'na, called by the Greeks Tyche, was, in mythology, the goddess of chance. Pindar considers her a sister of the Fates. She differed from them, however, in working without law, conferring joy or sorrow as she pleased. She had temples at Smyrna, Corinth and Elis, and two statues of her at Antium were consulted as oracles. Greek poets and sculptors represented her with a rudder, with a ball or wheel or with wings. The Romans proudly said that when she entered their city, she threw away her ball and put off her wings and shoes, to indicate that she meant to dwell with them forever.

Fortune Bay, an electoral district of Newfoundland. Population (1901) 8,762; chief towns: Belloram, Garnish, Harbor Breton, Pushthrough and Bay d'Argent.

Fortuny y Carbo (*fôr-tōō'nē ē kär'bō'*) **Mariano,** an eminent Spanish painter, was born at Reus, in Catalonia, in 1839, and studied at the Academy of Barcelona and in Italy. He was a vivid portrayer of domestic life in the east. Among his best-known works are *The Spanish Marriage* and *Academicians Choosing a Model.* He died at Rome on Nov. 21, 1874.

Fo'rum, the name applied by the Romans to a public space, especially to the market-place in a city, where public affairs were discussed, courts of justice held and money transactions carried on. In Rome the name was applied particularly to the famous *forum*, the low, level space extending from the foot of the Capitoline Hill to the north-eastern part of the Palatine.

Fos'sil. The body, the bones, the shells or any part or distinct trace of any animal



FOSSIL

or plant buried in the earth by natural processes is a fossil. Fossils need not be of great age, and the youngest are of recent origin. In some cases the bodies of the fossils, plants or animals are preserved. Trees buried by wind-drifted sand become fossils, though the wood is almost completely preserved. The bodies of mammoths have been found in the frozen earths of Siberia, the flesh still undecayed. They likewise are fossils. More commonly only the hard parts of animals, as the bones, teeth, shells etc., are preserved. In many cases even the substance has been replaced by mineral matter of a different sort. Thus, the lime carbonate of shells may be replaced by iron pyrites or some other substance, and the form of the shell reproduced in the new substance is a fossil. The woody matter of buried trees is sometimes replaced by mineral matter, as silica, and the structure of the wood is reproduced in the mineral substance. Wood which has been thus transformed is petrified. In other cases buried shells are dissolved out of their setting, and there remains only a cavity (mold), having the shape of the shell, to indicate its former presence. In still other cases the shell may be filled with sand or mud, and this filling may become hardened. The shell may then be dissolved, leaving the filling or cast. This also is a fossil. The tracks of animals made in sand or mud and preserved by burial or the impressions left by leaves buried in the sand or in mud are also fossils.

For a long time these petrified remains of animals and plants were not understood. During the middle ages the most curious ideas were held regarding them. The ones most commonly observed at that time were the shells of animals no longer existing, and they were asserted to be discarded molds of the Creator or abortive creative attempts into which the breath of life was not introduced. Lionardo da Vinci, in the early part of the 16th century, had understood their true nature, declaring them to be the remains of ancient life. But this was forgotten, and it remained for Cuvier to announce it again at the close of the 18th century. Large bones were being exhumed at this time near Paris, and Cuvier, from his extensive knowledge of anatomy, showed that they belonged to animals no longer living. The fossils are of importance in telling the past history of life on the globe. If we gather those from the oldest rocks, we get an idea of the earlier forms, and the others in later-formed rocks, taken all together, show the succession of animal life in geological times. Many of the fossil forms are entirely extinct. Other forms lived on, underwent modifications and developed into the animals of to-day. Within the past years the knowledge of fossil life has been greatly extended through explorations, and students of animal life are making out the lines of descent of our different modern animals. O. C. Marsh, E. D. Cope and other Americans made extensive and remarkable contributions to our knowledge of fossil life. Much attention is paid to the restoration and reconstruction of fossil forms. The work in this direction that has been done at the American Museum of Natural History in New York city is noteworthy. Not only have reconstructions of lost parts been made, but picturesque restorations of the entire animals, by the artist, Mr. Knight, under the direction of Professor Osborn. The science of fossils is palæontology (which see). See *Harpers' Magazine*, Vol. XCIV., p. 674 (1897), *The Century*, Vol. LII., p. 705 (1896); *McClure's Magazine*, Vol. XV., p. 512 (1900); Cope, *Tertiary Vertebrates*, U. S. Gov. (1884); *Am. Nat.*, Vol. XXII. (1898).

JOHN W. FOSTER

Fos'ter, John Watson, American diplomatist, was born in Pike County, Ind., on March 2, 1836, and graduated from the University of Indiana. After taking a law-course at Harvard, he practiced law at

Evansville, Ind., where the also was postmaster for a time. He distinguished himself during the Civil War as major and colonel of Indiana regiments. Subsequently he held diplomatic appointments, being minister to Mexico (1873–80), to Russia (1881) and to Spain (1883–85). In 1892 he succeeded Blaine as secretary of state, and in the following year represented the United States at Paris in the Bering Sea arbitration. He has also acted as plenipotentiary in the negotiation of reciprocity treaties, and has acted as peace-commissioner and envoy of the United States in international arbitration. His history of American diplomacy is a final authority.

Fos'ter, Stephen Collins, an American song-writer, was born at Pittsburg, Pa., in 1826. His compositions number 125, nearly a fourth being negro melodies. The best-known productions are *Old Folks at Home*, *Come where my Love Lies Dreaming*, *Uncle Ned*, *Old Dog Tray* and *Old Kentucky Home*. He died at New York on Jan. 13, 1864.

Fouche (*fōō'shā'*), **Joseph** (Duke of Otranto), minister of police under Napoleon, was born at Nantes, France, on May 29, 1760. He was elected to the national convention in 1792 and expelled in 1794. In 1799 he was appointed minister of police, and held the office until 1815. He was a man of one ambition—his own political success. He was indispensable to Napoleon, yet was dismissed by him twice, but reinstated each time. He was given office by Louis XVIII, but dismissed by him in September, 1815. He was then appointed ambassador to Dresden, and, being included among those who were banished, as having been concerned in the execution of Louis XVI, he henceforth led an exile's life and died at Trieste on Dec. 25, 1820.

Founda'tion, the base upon which a structure is built or placed, as the foundation of a building, a bridge-pier or an engine. The object is to furnish a base which shall not settle or, if it does settle in the least, that this settling shall be perfectly uniform. The best foundation-base is solid rock, as this is firm and not affected by water, but some gravels and clays are equally good, if they are not saturated with water. The most difficult soils for foundations are soft, compressible earths saturated with water. Where it is possible, it is best to go down until rock, gravel or "hard-pan" is reached. It is often necessary to go down 75 or 100 feet to find such firm material. Where the soil is of a yielding nature, the area of the base must be so enlarged as to decrease the pressure per square foot to safe limits. A common method in soft soils is to drive piles, saw them off at the surface and erect the foundation on a platform on these piles. The whole of the Back-Bay district in Boston is on pile-foundations. Sometimes masonry, concreted timber or iron platform foundations are used. Thus in Chicago, where the soil is boggy and it is impracticable to reach good rock, the foundations of many of the heaviest buildings have been erected on an iron and concrete platform. A cubical pile of crossed iron-rails is made and filled in with concrete, and the building is placed on these. For foundation-bases under water, or under soils saturated with water, coffer-dams and caissons must be used to get the masonry-work down to a firm base. (See COFFER-DAM and CAISSON.) The Romans seem to have been the first to make a serious study of foundations. It is said that the sites of the cathedrals of the middle ages were selected primarily with reference to getting a suitable foundation, and that, even so, many mediæval structures have disappeared on account of improper foundations. The subject of foundations is one of the most important problems of modern engineering, and it is often found necessary to spend large sums in preliminary borings to determine the character of the soils.

Foundry, an establishment for casting. Casting consists in pouring a molten metal into a suitably shaped mold in which it cools and solidifies, thus forming a metallic figure of the shape of the mold. Metal-casting is as old as civilization, but it has been greatly developed in very recent times. Most metals can be cast, but iron, brass, bronze, zinc, aluminium and type-metal are the metals most used for casting in the industries. The molds are formed of loam, molding-sand, plaster of Paris or metal. In type-founding, steel molds are used. To form a mold in loam or sand requires a pattern. This pattern is usually of wood, but may be of metal. Pattern-making for casting parts of machinery forms a special trade. Iron is melted for casting in a furnace called a cupola. The principle of foundry-work is simple, but the practice of it requires much skill and special knowledge, and special treatises must be consulted for details of the work of a foundry.

Fourier (*fōō'rĭ-ĕr*), **Jean Baptiste J.,** a distinguished French physicist and mathematician, was born on March 21, 1768, and died at Paris, on May 16, 1830. He taught mathematics at Saint-Maur, at the Normal School and at the Polytechnic School in Paris, successively. In 1798 he went to Egypt with Bonaparte. Later he was appointed prefect of Grenoble in France, a position which he held for 14 years. It was while here that he wrote his immortal work on the *Analytical Theory of Heat*, which was published in 1822, and which has ever since remained a model in clearness and method for all writers on mathematical physics. It was this work which, six years after its publication, suggested

to Georg Ohm, the German mathematician, the remarkably simple description of the manner in which electric currents flow through conductors, now known as Ohm's law. Fourier was quite as remarkable for breadth of culture as for special attainments in mathematics. At the same time with Cuvier he was perpetual secretary of the French Academy of Science.

Fowl. See POULTRY.

Fox, an animal closely related to the dog and jackal, but distinguished by the sharp muzzle, erect ears, vertical pupil of the eye and long, bushy tail. There are several kinds, common in different parts of the world, with the exception of South America. The one most widely distributed

CROSS FOX (a Variety of the Red Fox)

in this country is the red fox, which resembles the common fox of Europe and Great Britain, but is distinguished by slight differences. This animal is about thirty inches in the body and head, and the tail is about a foot and one half long. Its fur is a reddish-yellow, with the tips of the ears and tail black and a white line on the belly. There are several slight varieties differing in details of color. It is a clever and cunning animal, being often able to elude the hounds in the chase. The Arctic fox, which ranges southward to Labrador and Newfoundland, has beautiful silky fur, bluish or brown in summer and pure white in winter. The black fox or silver fox holds first place among fur-bearers; in London a single skin brought $2,784, and in this country skins not infrequently sell at from $600 to $1,200. The animal is jet-black, save for snow-white tip of tail and a few scattered white hairs low on its back.

Fox, Charles James, the son of the first Lord Holland, was a British statesman, born on Jan. 24, 1749. He was educated at Eton and Oxford and at nineteen was elected to Parliament. He became an active supporter of the administration of Lord North, and was made an admiralty-lord. This office he resigned in 1772, and was next year appointed a commissioner of the treasury, from which he was dismissed when he went over to the ranks of the Opposition. During the American Revolutionary War, he was an opponent of the coercive measures toward the colonies adopted by the government, and was a strenuous advocate of the claims of the colonists. After occupying various other high offices of state, he died on Sept. 13, 1806, and his remains were interred in Westminster Abbey near those of Pitt. Burke called him "the greatest debater the world ever saw." See *Early History of C. J. Fox* by Sir George Trevelyan.

Fox, George, was the founder, of the Society of Friends, commonly called Quakers, and was born at Drayton, in Leicestershire, England, in July, 1624. At nineteen his religious convictions forced him into the belief that he was the subject of a special divine call, and, leaving home, Bible in hand, he wandered over the country, holding meetings. He not only was a great religious, but a great social, reformer. His dress, mode of speech and manners were different from others. He took off his hat to no one; addressed men and women as *thee* and *thou;* and opposed all unnecessary form in religious observance. He was persecuted and arrested, but the sincerity of his views was admitted. He visited America with Penn, Barclay and Keith. Fox died on Nov. 13, 1690. He was known as a lovable and Christlike man, with a heart full of love for his fellow-beings. See *George Fox and the Early Quakers* by A. C. Bickley.

France, the most westerly portion of Europe, lying between the Atlantic and the Mediterranean. France in its present limits covers 207,054 square miles, or one nineteenth of Europe, with a coast-line of 1,760 miles (1,304 on the Atlantic and 456 on the Mediterranean). It is bounded on the north by the English Channel and the Strait of Dover; on the northeast by Belgium and the grand-duchy of Luxemburg; on the east by Lorraine, Alsace, Switzerland and Italy; on the south by the Mediterranean and Spain; and on the west by the Bay of Biscay and the Atlantic. Its greatest length from north to south is 606 miles and from east to west 556 miles. Its land-frontier extends over 1,575 miles, of which 1,156 miles are along the Belgian, German, Swiss and Italian frontiers and 419 miles along the Spanish frontier.

Surface and Drainage. The country is divided between the lowlands in the northwest and a large tableland which covers the southeastern half, and on the south and southeast borders the slopes of the Pyrenees and Alps. The tableland rises in its highest parts from 3,000 to 4,000 feet, with deep river-valleys and mountain-chains, reaching 5,000 or 6,000 feet in height. The plain slopes toward the Rhône and the Mediterranean, fringed by the Cevennes Mountains, the highest peak being Mont Mezenc (5,754 feet). This chain of mountains separates two widely different regions: the fertile, sunny and warm plains

of the Rhône and Languedoc and the plains of the Rouergue, dreary, cold and high, where only rye grows and flocks of sheep find rich grazing-grounds. Central France is the highest part of this tableland, a region of granite, gneisses and slates, with many extinct volcanic cones surrounded by wide sheets of lava. Puy-de-Saucy, 6,188 feet, is the highest peak of the Auvergne Mountains in central France. Besides the Cevennes, the mountain-ranges include the Pyrenees, the Vosges, the Jura and the Alps. The Pyrenees separate France from Spain, extending 260 miles, the highest peak, Néthou, being 11,168 feet high. The passes across the Pyrenees are few, lofty and difficult, the lowest being 6,700 feet high, so that railroads hug the seacoasts or stop at the foot of the mountains. The Vosges and Jura Mountains and the Alps are on the eastern border. Since 1860, with the annexation of Savoy, the northern slopes of Mont Blanc, the highest and most beautiful mountain in Europe, are in French territory. The passes of Mont Cenis and Mont Genèvre lead into Italy, as does also the famous Mont Cenis tunnel. The largest rivers are the Loire, 670 miles long, the Garonne (346), Dordogne (305), the Seine (485), and the Rhone (507). The island of Corsica is the only large island on the French coast belonging to France.

Political Divisions—Cities. France is divided into eighty-seven provinces or departments. The principal cities are Paris (2,888,110); Lyons (523,796); Marseilles (550,619); Bordeaux (261,678); Lille (217,804); Toulouse (149,576); Nantes (170,535); St. Etienne (148,656); Le Havre (136,159); and Rouen (124,987).

History. The earliest historian of France was Julius Cæsar, who invaded and conquered it in 58 B. C. It was then called Gaul, and the people were mainly Celts. It covered not only France, but Belgium and parts of Switzerland and Germany. At the time of Cæsar's invasion the Gauls had towns and fortifications, knew the arts of embroidery and working metals, and had made improvements in agricultural implements; but they were a rough, savage people, their females slaves, their prisoners barbarously treated and their religion idolatry, with the sacrifice of human victims. After Gaul became a part of the Roman empire, it was gradually civilized and in the second century A. D. it was the most populous of the Roman provinces. The Roman power yielded to that of the Franks, a Germanic tribe, under Clovis in 481. Paris was his capital. This first dynasty was called the Merovingian. Under Charlemagne, the second ruler of the second dynasty, called Carlovingian, which began in 751, France was raised to a high position in western Europe. The real founder of the French monarchy, as distinct from the Frankish kingdom of Charlemagne, was Hugh Capet, count of Paris and Orleans, who was made king by the feudal chiefs in 987. The Norsemen, however, had already seized what now is Normandy, and in the 12th and 13th centuries their Anglo-Norman descendants owned far the greater part of France. For many years the kings of England laid claim to the crown of France. Hence the enmity between the two countries; the crusades and the Crimean war being the only instances of a military union between them. Normandy, Maine, Touraine and Poitou were taken back from France (1180–1223). With Philip VI (1328–50) came the house of Valois, which succeeded to the throne by the Salic law, which had come down from the Franks and excluded women from royal power. From 1339 to 1422 France suffered from the long though intermittent struggle with England, in which took place the battles of Crécy (1346), Poitiers (1356) and Agincourt (1415). Louis XII, the Father of His People, and Francis I wasted the resources of the country in fruitless efforts to establish their claims on Lombardy. Francis I in his wars with Charles V secured Burgundy (1544), and Henry II recovered Calais. Under Francis II the Catholic house of Guise became powerful; while the reform movement was headed by their opponents, the house of Bourbon. The massacre of St. Bartholomew (1572) under Charles IX did much to weaken France.

Henry IV of Navarre (1589–1610), the first of the Bourbon princes, was succeeded by Louis XIII, who, influenced by Richelieu, sided with the Protestant princes in the Thirty Years' War, and he by Louis XIV (1643–1715), in whose reign the French monarchy reached its highest point of luxury and power. He extended the borders of France to the Rhine, and art, literature and science flourished to a degree unknown before; but the revocation of the edict of Nantes (1598) sent 400,000 of its best citizens from France. In the reign of Louis XV Corsica was added to France, but by the peace of Paris (1763) the larger part of the French colonies was yielded to England. Louis XVI, a well-meaning but weak prince, succeeded to a weakened throne. The spirit of the time, the success of the American War of Independence, the sufferings of the people and the oppressions of the nobles all united in the Revolution which broke out in 1789. In January, 1793, the king was beheaded; a reaction set in; and the people, wearied of bloodshed, were anxious for peace, and a general amnesty was declared in 1795. The state was governed by three consuls, Napoleon Bonaparte being the first, after the directory, to fill that office. At the head of the French army he gained the battle

of Marengo. By the peace of Lunéville the boundaries of France were once more extended to the Rhine. In 1804 Napoleon was declared emperor by the vote of the people. In his victorious career he made himself king of Italy, made Holland and Naples vassal kingdoms, set up in Germany the Confederation of the Rhine, conquered Prussia, occupied Portugal, deposed the Bourbons in Spain, made Rome a French town and carried off the pope to Fontainebleau. With 1811 came a turning point in his fortunes; he was defeated in 1814; Paris capitulated to the allies and Napoleon retired to Elba. Louis XVIII (1814–24) succeeded to the throne, his reign being soon interrupted by the return of Napoleon, who met his final defeat at Waterloo. Charles X and Louis Philippe end the long line of French kings, the Revolution of 1848 overthrowing the latter. Louis Napoleon was in 1848 elected president of the new republic, but assumed the powers of a dictator by the *coup d'état* of December, 1851, and a year later, by a vote of the people, became emperor as Napoleon III, reigning nearly twenty years. The Franco-German War (1870–71) was begun by him as a vent for the growing discontent of the people; but the French army lost battle after battle, until at Sedan the emperor, with 83,000 men, surrendered to Prussia. France, following this disastrous outcome of the revival of imperial rule, again became a republic.

Following Bismarck's (*q. v.*) resignation in 1890 an alliance was formed between France and Russia, due to a mutual desire to counterbalance the growth of German power. It was in pursuance of this treaty that France, when Germany declared war on Russia, mobilized her army. England having settled her territorial disputes with France in 1904, with Russia in 1907, there resulted a friendly understanding called the "Triple Entente," although there was no formal alliance. The agreement with Russia settled disputes over the relative "spheres of influence" of the two countries in Persia; that with France secured the recognition of French claims in Morocco in exchange for non-interference with England's occupation of Egypt. See *French and English* by Hamerton; see *French Revolution* by Carlyle; *History of the Girondists* by Lamartine; and *History of France* by Charlotte M. Yonge.

Natural Resources. Owing to its long coast-line of 1,760 miles the fisheries are of great importance. The country is deficient in minerals; iron and coal are imported in large quantities, though it has excellent quarries of stone.

Agriculture. Three fourths of the people live in the country and one fourth in the cities. Half of the people live by agriculture. The products are wheat, oats, rye, barley, buckwheat and corn; beet-roots grown for sugar cover half a million acres; while market-gardening has been carried to great perfection, reaching often from $300 to $900 an acre in the value of the crop. Cattle-breeding, raising horses and mules and sheep-rearing are large industries.

Manufactures. In manufactures France is progressing rapidly. It has nearly 150,000 factories, employing 2,000,000 people. France holds the first rank in silk-manufacture; and is about equal to Germany in the manufacture of cotton-goods, though below Great Britain and the United States. All industries connected with furniture, dress and articles of luxury are active, and show the artistic taste for which the people are noted. Valenciennes, Chantilly and Alençon laces, Sèvres and Limoges porcelain and Aubusson carpets are examples of the productions of this class, while in the manufacture of jewelry few places in the world can rival Paris. It also is the greatest book-market in the world.

Revenues and Commerce. The revenues of France in 1911 were 4,386 million francs, and its expenditures nearly equalled this sum. Commerce is carried on by 15,878 sailing-vessels of 638,265 tons, with crews of 72,968 men; there also are 1,670 steamers of 806,073 tons and crews numbering 16,558. Much internal commerce is conducted *via* the rivers, canals and railways. These canals connect the natural waterways and thus establish easy communication through the interior as well as between the Atlantic and the Mediterranean. There are 30,709 miles of railway and 113,332 of telegraph lines.

Government. The present government is republican. There are a president, elected for seven years, and two houses, the chamber of deputies with 584 members and the senate, which consists of 300 members, of whom seventy-five hold their seats for life. There are eleven ministers, corresponding to the cabinet-officers of the United States. There are three courts, the civil, criminal and supreme court, the latter called the court of cassation. The unit of the local government is the commune, most of these having less than 1,500 inhabitants.

The president's powers are very great. He can, among other things, introduce as well as execute the laws, and has the treaty-making power without asking the approval of an independent body, as the president of the United States is obliged to do. He exercises these powers through his ministers, whom he himself appoints. His annual salary is 600,000 francs, equivalent to $120,000, and he is allowed as much more for the social duties of his office. He makes appointments to all civil and military offices, and the army is under his control. The population of France is 39,601,509, of which 1,126,531 are foreigners. The annual

increase of population is slower than in the other chief countries of Europe, owing to the small number of marriages and the small number of children in a family. In 1907 the death-rate was greater than the birth-rate. The French emigrate only in small numbers, and the French colonies have never brought any large revenue to the state. There are, it is estimated, 125,000 French immigrants in the United States.

Education. This is free, and provided by common schools, classical and scientific schools, colleges and universities. Free public instruction commences with infant-schools attended by children from 2 to 6 years of age. Then follow the primary schools, which all children between 6 and 13 are obliged to attend. Next come the superior primary schools; then the *Lycées*, the latter two being maintained separately for the sexes.

The record for one year estimates the annual cost of maintaining these institutions as, for boy's *Lycées* 16 million francs for girl's *Lycées* 3½ million francs. Among other higher institutions of learning maintained by public funds are the College of France and the Museum of Natural History. In Paris is the famous University of Paris, which as early as the 16th century had 12,000 students and now has 15,000 to 18,000 in attendance. There is a naval school at Brest, and there are many schools providing professional and technical education.

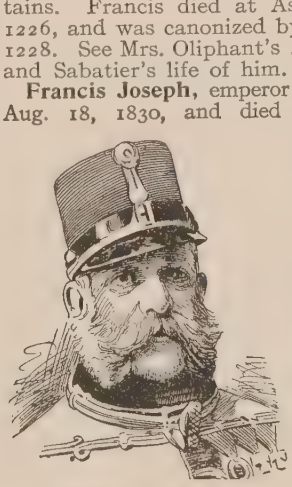
Francesca, Piero della (*pē-ā'rō dāl'lā frān-chās'kā*), an Italian painter, was born in 1398, and died in 1484. Some fine pictures of his exist still, but his early ones perished, and Raphael painted out his frescoes in the Vatican. His fame comes chiefly from his being the first Italian artist to formulate the principles of linear perspective, study the anatomy of the nude and employ lay figures. He modeled these in clay, and draped them with costumes folded wet. He lost his sight at 60, and devoted himself to mathematics.

Francis I of France, was born at Cognac, France, on Sept. 12, 1494, and became king on Jan. 1, 1515. His first act was to reconquer Milan. Charles V, Henry VIII and the pope were in alliance against him, driving his troops out of Italy and invading France on the north. Taken prisoner at the battle of Pavia (1525), Francis was kept a year at Madrid, gaining his freedom only by renouncing Flanders, Artois, the duchy of Burgundy and all his Italian possessions. His struggles with Charles V continued until the peace of Crécy or Cressy, 1744. His reign is marked by the Renaissance (the new birth of learning), the beginning of the Protestant Reformation and the strengthening of the power of the monarchy. He fostered learning and art, invited painters and scholars to his kingdom, founded libraries, opened schools and built several of the finest palaces in France; but his persecution of the Vaudois has left a stain on his memory. He died March 31, 1547. See *Court and Reign of Francis I* by Pardoe and *Francis I and His Times* by Corgriet.

Francis II of Germany and I of Austria, was born at Florence, Italy, on Feb. 12 1768, and succeeded his father, Leopold II, in 1792. His reign was a series of wars against Napoleon, in which, with the exception of the last, he was beaten. In 1806 he formally abdicated the crown of the Holy Roman Empire and made Austria an empire, himself becoming its first emperor. Although narrow-minded, Francis was a popular ruler. He died at Vienna on March 2, 1835.

Francis d' Assisi (*ās-sē'zē*), founder of the Franciscan order and a saint of the Roman Catholic church, was born in 1182. In his early years he was remarkable for his love of gayety; but sickness turned his thoughts from earth, and he at once commenced the practice of the strictest forms of religious discipline. He submitted to humiliations without number. By 1210 he had 11 followers, and he then drew up a set of rules for their guidance. The order was approved by Pope Innocent III in 1210, and in 1212 the Church of Santa Maria degli Angeli was assigned as their home. At the first general assembly, held in 1219, 5,000 members were present. From the sultan of Egypt Francis obtained for his order the guardianship of the Church of the Holy Sepulcher, which it still retains. Francis died at Assisi, on Oct. 4, 1226, and was canonized by Gregory IX in 1228. See Mrs. Oliphant's *Francis d' Assisi* and Sabatier's life of him.

Francis Joseph, emperor of Austria, born Aug. 18, 1830, and died Nov. 21, 1916, ascended the throne in 1848. He was crowned King of Hungary in 1867. His first task was to subdue the Hungarian revolt and pacify Lombardy (q. v.). But, in 1859, Lombardy was ceded to Italy. In the war with Prussia (*q. v.*) in 1866 Austria was defeated by Germany. Later an alliance was formed with Germany, and in 1882 with Italy. (See DREIBUND). These alliances had important effects upon the course of the Great War. By the death of his only son, Rudolph, his



FRANCIS JOSEPH I

nephew, Francis Ferdinand, who was assassinated in 1914, became heir. Ferdinand's brother Charles Francis Joseph (*q. v.*), succeeded Francis Joseph as emperor.

Francis Xavier. See XAVIER.

Francis'cans, also called **Minorites** or **Lesser Brethren,** a religious order of the Roman Catholic church, founded by Francis d'Assisi in 1210. The head of the order is called the general and lives in Rome. It is the parent of many religious institutions, the earliest being Observantists, known for their more strict observance of the rules; the Conventuals are the less rigid party. Another offshoot is the Capuchins, founded in the 16th century. There also are several orders of nuns in the Franciscan institute, the Little Clares, Capuchins and Urbanists being well-known. As a literary order they have been eminent in the theological sciences. The order supplied the papal chrone with Nicholas IV, Alexander V, Sixtus IV, Sixtus V and Clement XIV. See Jessopp's *The Coming of the Friars.*

Franco-Prussian War (1870–71). The ostensible cause of this war, which proved so disastrous to France, was the offer, after the deposition and expulsion of Queen Isabella II, of the Spanish crown to Prince Hohenzollern, a relative of the king of Prussia. This France treated as an insult and peril to her. Though the prince declined the offer, France was, through the selfish ambition of the vain and shallow Napoleon III (q. v.) hurried into a war for which, as her prompt and humiliating defeat demonstrated, she was most poorly prepared.

From the very outset the war was disastrous to France, which was able to put, altogether, not more than 250,000 in the field against 450,000 Germans, with the most efficient equipment and very able generalship. The conflict began early in August with the crossing of the German frontier by a French division, 30,000 strong, which attacked the little town of Saarbrück, defended by a small force of Uhlans who were compelled to retire. At this affair there were present Napoleon and his son, the prince imperial, who, it was heralded by the emperor, here received his "baptism of fire." Two days later occurred the affair at Weissenburg, where the German crown-prince (afterward Emperor Frederick) fell upon the right wing of the French army under MacMahon, and on Aug. 6 attacked and routed the French at Wörth. On the same day the Germans, under Steinmetz, gained another decisive victory at Spicheren, which was followed shortly afterward by a further success at Courcelles, over Marshal Bazaine, who was driven into Metz and there besieged by a German division under Prince Frederick Charles. Just before the investment of this, the capital of Lorraine, occurred the battle of Vionville and the murderous one at Gravelotte (Aug. 14–18), seven miles west of Metz, where some 35,000 men of both sides were placed *hors de combat.* These crushing disasters to soldiers with whom Napoleon I had terrorized all Europe were due to the selfishness and incompetence of Napoleon III and his officers and the absence of any fixed plan of campaign.

The Germans, by the strategy of Field marshal Von Moltke, lost no time in following their successes by others equally demonstrative of their preparation for the war. At the end of August the French were once more defeated, this time in the battle of Beaumont, which compelled MacMahon to abandon the attempted relief of Bazaine at Metz, to fall back with the French emperor and to shut himself and his army of 80,000 within Sedan, only to capitulate on the first day of September. When news of the surrender and the capture of the French emperor reached Paris, the tumult in the capital led Empress Eugènie to take flight, when the third republic was proclaimed and the empire collapsed. This was followed (Sept. 19) by the investment and siege of Paris by the Germans and, a week later, by the surrender of Strassburg and 18,000 French, and a month afterward by the surrender of Metz (Oct. 27), its fortress and 173,000 men. Various other victories fell to the Germans during the remainder of the year, and Paris capitulated, after a number of bloody sorties, Jan. 28, 1871 The end came with French overtures for peace, adopted at Versailles (Feb. 26) which were ratified, May 10, 1871, by a definitive treaty between the two nations at Frankfort-on-the-Main.

Franco'nia Mountains. See WHITE MOUNTAINS.

Frank'fort, the capital of Kentucky, is situated on the Kentucky River, 29 miles northwest of Lexington. It is noted for its beautiful scenery, has well-paved streets and several parks. Frankfort has an admirable public-school system, and other educational institutions are a young ladies' seminary and a military school. It contains the state-house, the state-library, the penitentiary and a beautiful cemetery. It has a large lumber-trade, and manufactures lumber-products, twine, pottery etc. Frankfort has the service of three railroads and a population of 10,465.

Frankfort-on-the-Main, a city of Prussia, once a free city, is situated on the right bank of the Main, 22 miles from its junction with the Rhine at Mainz. There are seven bridges across the Main at Frankfort, one of them built in 1342. The city has been extended and improved, the fortifications being replaced by ornamental promenades and the river bordered by broad quays. One of the squares is adorned with a statue of Goethe, its most celebrated citizen, and the Gutenberg monument com-

memorates the invention of printing. The exchange, opera-house, museums, art-galleries, public library, two conservatories of music and the central station, one of the largest and handsomest railroad-stations in Europe, are among the modern buildings. Frankfort is a wealthy city, having always had a large trade in iron and steel-goods, leather, skins, coal, wine and beer, sewing machines, soap and perfumery. Its chief importance, however, is due to its being one of the money-markets in the world. It was the home of the Rothschilds, and their ancestral house is now the sole relic of the famous Jew-street of Frankfort. It is said to owe its name to Charlemagne, who here led his Franks across a ford of the river Main; and from 843 to 889 it was the capital of his kingdom. It was the first free city of the German empire, and the most important. It was long famous as the place of the election of the German emperors, and the town-house contains the imperial hall where each newly elected emperor held a public banquet. The coronation took place in the Cathedral of St. Bartholomew, which also contains the chapel in which the electors voted. The North German *Diet* met at Frankfort from 1816 to 1866. Frankfort became Protestant in 1530; lost its independence in the Confederation of the Rhine; became free again in 1816; but in 1866 was taken by Prussia. The peace of Frankfort, which ended the Franco-German War, was signed here in May, 1871. Population 414,598.

Frank'incense, a name used to designate fragrant, resinous substances, which give off a strong odor in burning and are used in religious services. That of the Jews and ancient Greeks and Romans is known as *olibanum*. The natural gum of several kinds of trees, as the fir, is the common frankincense.

Frank'lin, a town of Williamson County, Tenn., is situated 18 miles south of Nashville on the L. and N. Railroad. Franklin has planing and flour-mills, carriage-factories and several steam cotton-gins. It has public schools, and here are located Tennessee Female College, established in 1856; Harpeth Male Academy and a Masonic Temple. Population 2,924. An important battle was fought here on Nov. 30, 1864, between the Union forces under General J. M. Schofield and the Confederate troops under General J. B. Hood. After a hard-fought battle, General Hood was repulsed with a loss of 6,000 men, while the Union army lost 2,300 men.

Franklin, a term frequently found in English literature. It means a freeholder or substantial householder of the middle class. The word comes from the late Latin word *Francus*, meaning free. It is used by some of the older English writers to mean a host who

voyage in 1845 in search of the northwest passage is memorable.

Franklin, Benjamin. There is something perennial about the spirit of this great American patriot of civil life, philosopher, statesman, diplomat and writer. Though born in the infancy of science (on Jan. 17, 1706), and dying (on April 17, 1790) in the infancy of the republic he had helped establish, he projects himself into the interests and problems of to-day and of all times as does no other man who figures in American history. His many-sided genius, sublimated common-sense, practical citizenship, hospitality to new ideas and ideals and his moral courage make him a character to whom men of any age must have turned with confidence and hope. There is nothing in Franklin's ancestry or environment to account for him. In the family-history for four centuries behind him there had not been one man who rose above mediocrity, or one who fell below respectability. The Franklins were small landed-proprietors or tradesmen in Northamptonshire, England; simple, industrious, pious. The father emigrated to Boston in 1682, and set up in business as a candle-molder and soap-boiler. His tenth child was taken to the Old South Church, christened Benjamin, and dedicated to the ministry. Lack of money for the necessary education forced the boy to learn the printer's trade. Disputatious, sarcastic, vain, resenting control and given to expressing unpopular opinions, the boy got into disrepute in the strict Puritan town. So, at 17, he ran away to Philadelphia. He landed with a silver dollar a trade, plenty of self-confidence and a suddenly-formed resolution to turn over a new leaf, thus showing remarkable strength of character. Ever afterward he was noted for his suavity, avoidance of controversy and patience.

BENJAMIN FRANKLIN

At 23 he owned his own printing-office and was publishing the *Pennsylvania Gazette*, which, is it claimed, survives to-day in *The Saturday Evening Post*. For the next 20 years he was the foremost journalist in the colonies. *Poor Richard's Almanac*, issued annually for a quarter of a century, made him known from city mansion to the remotest frontier-cabin. While making fame and fortune as a printer, publisher and writer, he was studying foreign languages and literatures, experimenting in science and taking a conspicuous part in local affairs. From 1736, when he was chosen clerk of the Pennsylvania Gen-

eral Assembly, until 1786, when he returned from Paris at the close of the American Revolution, he was almost continually in the public service, and this without compensation. Big and little things alike claimed attention. Now he was organizing a police or fire-department or local militia; now putting a street-lamp before his gate and paving his sidewalk to arouse public spirit; building an Academy of Science; a church free for all denominations; collecting books for the first free circulating library; organizing a system of colonial defense against the Indian; inventing rockers for his easy-chair and a portable fireplace, called the Franklin stove, and refusing to take out patents. He always declared that as we are indebted to the ingenuity of men in the past, so it is only a duty to give our own contrivances to the present and future.

After 1760 (his 54th year) Franklin spent a quarter of a century abroad in the service of his country. His discovery of the identity of lightning and electricity had long before made him the best-known American in Europe. Learned societies and universities welcomed him, and he soon won equal distinction as a diplomat. Ten years he spent in London. He got the stamp-act repealed. An eminent English statesman declares to-day that had the king and Parliament accepted Franklin's just contention that the American colonies were self-governing, owing allegiance only to the sovereign, the Revolutionary War might never have been fought. Franklin, after a decade of working in vain for peace with honor and justice, returned to help frame the Declaration of Independence, to place $20,000 of his fortune at the service of Congress, and then cross the sea to win the help of France in the cause of American liberty. His position in Paris, although he represented poor, rebel colonies whose success seemed unlikely, was extraordinarily influential, unprecedented and never again equalled in the history of diplomacy. Camp and court and the world of science were at his feet. Never before had Europe seen a man at once so wise and witty, so urbane and with such upsetting ideas of the equality of men and of the duties of rulers. His simple dress became the fashion; his benign face adorned ornaments of cameo; his portrait was in college, palace and cottage. He was the first great plebeian standing upright before kings, and he fired the imagination of the people. This is believed to have had its influence in hastening the French Revolution.

It is flattering to our pride to learn that the mind, character and versatile genius of Franklin have been called an epitome of all that is best in the typical American. He won as the best among us win,—by straightforwardness. He introduced "shirt-sleeve" diplomacy into Europe; he had shrewdness, good nature, open-mindedness, persistence and infinite knowledge of the world and of human nature.

When Franklin returned to America, he was in his 86th year and begged for rest; but he became chairman of the municipal council, a member of the constitutional convention that drafted the constitution; and he organized the postal service, travelling in a carriage through every state. Conquered at last by the infirmities of age, he continued to give scientific discoveries to the world. His last public act was to affix his signature to a memorial to the state legislature, as president of the Pennsylvania Abolition Society. Abolition in 1790 brings Franklin into touch with Lincoln three quarters of a century later. He seems equally in touch with wireless telegraphy, aerial navigation, the currency and other questions of to-day. No life of him is comparable to his own autobiography. As literature it is a classic, and as a human document it is unsurpassed in its illuminating candor.

Franklin, Admiral Sir John. To the man who perishes in a brave cause the world pays peculiar honor, and when his death is obscure and lonely and his grave unmarked, it adds tender regret. This heroic Arctic explorer is one of the few whose memory is so enshrined in the hearts of men. To hear his story is to be, not saddened by his fate, but uplifted because such a man, and one of our own Saxon blood, has lived and shown how a devoted man may die.

It is not improbable that the British admiral sprang from the same north-of-England stock as our own Benjamin Franklin. He was born on April 16, 1786, in Lincolnshire, a county that adjoins Northamptonshire, whence Benjamin Franklin's father had emigrated a hundred years before. The name is old Saxon for free-holder, and the ancestors of both were small landed-proprietors or tradesmen—thrifty, industrious, pious, unremarkable. At 14 John Franklin was on the quarter-deck of a naval vessel; at 15 in the battle of Copenhagen where Nelson won his first laurels. Two months later the boy sailed with an expedition to explore and map the coast of Australia, then almost unknown. Here he acquired skill in surveying, deep-sea sounding and astronomical observation that fitted him for his work as a scientific explorer. Adventure marked the gallant boy for its own. He was wrecked on a coral island; he was signal officer on the *Bellerophon* at Trafalgar; he commanded a vessel at the battle of New Orleans; at 32 he was a minor officer in a polar expedition. At 41, with the rank of captain, he commanded an expedition to map Mackenzie River. Honors crowded

thick and fast upon him—a knighthood and then, for seven years, the governorship of Tasmania. In May, 1845, as an admiral, he sailed again, with the *Erebus* and *Terror*, to discover the northwest passage. Calmness in time of danger, resourcefulness, the highest order of seamanship, a sanguine temperament, the capacity for inspiring trust and loyalty in the men of his command and scientific ardor had long marked Sir John as the one man in England most likely to succeed in so hazardous an undertaking where so many had failed.

He discovered the northwest passage, but at so terrible a cost that the 20th century was six years old before anyone ventured to force a way through it. (See AMUNDSEN, ROALD).

The *Erebus* and *Terror* were last hailed by whalers in Baffin's Bay in July of 1845. Franklin died on King William's Island, Boothia, at the eastern end of the passage that had been sought since the days of Sebastian Cabot, in June of 1847. The survivors all perished in the attempt to reach the main land. Details of the disaster were recovered piecemeal, along with relics from the abandoned ships, from Esquimaux and from a packet of buried papers. Fifteen expeditions were fitted out first to relieve, then to find trace of, the lost explorers. Two of these were led by Dr. Elisha Kent Kane, the American scientist. It was not until 1857 that the yacht *Fox*, sent out by Lady Franklin, brought back the story of Franklin's tragic end. His resting place in that vast tomb of ice has never been located, for the ships vanished. Lady Franklin spent her entire fortune and 15 years in efforts to recover his body. The monument raised in Westminster Abbey pays tribute to her as well as to her hero. For the cenotaph Tennyson, the laureate, wrote these words:

"Not here! The white north holds thy bones; and thou,
Heroic sailor-soul,
Art sailing on another voyage now,
Toward no earthly pole."

See *Life* by Beesly.

Franklin, William Buel, American general, was born at York, Pa., on Feb. 27, 1823, and graduated at West Point in 1843. Early in his career he served in the War with Mexico, and on the outbreak of the Civil War he was appointed colonel of the 12th infantry, subsequently rising to the rank of major-general. He commanded the sixth corps through the peninsular campaign, fought at South Mountain and Antietam, and was in command of the left grand division of the United States army at Fredericksburg at the close of 1862. In 1864 he was given command of the 19th army corps, which took part in the Red River expedition, but was wounded and obliged to retire from active service. After the war he became vice-president of the Colt Firearms Company at Hartford, Conn. In 1880 he was president of the board of managers of the National Soldiers' Home, and in 1889 was United States commissioner to the Paris exposition of that year, which won him the insignia of grand officer of the Legion of Honor from the French government. He died on March 8, 1903.

GEN. WILLIAM B. FRANKLIN

Franks, a name applied in the 3d century to a number of German tribes living on the middle and the lower Rhine. They were a stalwart race of warriors, distinguished by long hair, blue eyes and largeness of limb. They lived in villages, and had gardens and vineyards. To the Salian Franks is due the celebrated Salic law.

Franz, Robert (1815–1892), was one of the most important of German song-writers, ranking with Schubert and Schumann in consummate artistry. Besides 257 songs for single voice, he composed sacred and secular choral works and made masterly arrangements of Bach, Handel and other great composers.

Fra'ser, Hon. Duncan C., was born in Nova Scotia, and graduated from Dalhousie University. He held important public positions in his own province; was first elected to the Canadian House of Commons in 1891; and was appointed a judge of the supreme court of Nova Scotia in 1904. He was appointed lieutenant-governor of Nova Scotia in 1906. An able platform-speaker, he is an ardent free-trader.

Fraser, William A., was born in Nova Scotia in 1859. By profession at first a mining engineer, he became a frequent contributor to magazines, devoting himself especially to animal stories. Among his books are *The Outcast*, *Thirteen Men*, *Thoroughbreds*, *Mooswa* and *The Lone Furrow*.

Fraser (*frā'ser*) **River,** the principal stream of British Columbia, is formed by two branches, the more important of which rises in the Rocky Mountains. The river is 800 miles long, and flows into the Georgian Gulf. Salmon-fishing is one of the great industries along its banks. Steamboats can navigate it for 100 miles, when the river passes by a series of swirling rapids through the Cascade Range, the grand cañon of the Fraser.

Fraunhofer (*froun'hō-fĕr*), **Joseph,** a German optician and physicist, was born near Munich on March 6, 1787, and died there

on June 7, 1826. His early training was that of a glass-polisher, being apprenticed at the age of twelve. His chief accomplishments, perhaps, are the invention of the diffraction-grating (See DIFFRACTION-GRATING); the discovery of the dark absorption lines in the solar spectrum, now known as Fraunhofer's lines; the discovery that the stars have spectra of the same general type as the sun but different from that of the sun; and a general discussion of the phenomena of diffraction.

His most important papers have been edited and reprinted by Professor Ames in Harper's *Scientific Memoirs*.

Frechette (*frā'shĕt'*), **Louis**, LL. D., president of the Royal Society of Canada and member of numerous literary and learned societies, was born at Levis, Quebec, on Nov. 16, 1839. He was educated at Laval University and Nicolet College, was called to the bar in 1864, afterward removing to Chicago and living there until the great fire of 1871. He divided his attention between law and editing *Le Journal* of Quebec and *La Patrie* of Montreal, representing Levis in Parliament in 1874, until in 1889 he became clerk of the legislative council of the province of Quebec. His publications are numerous and met with appreciation. In addition he made translations in French of the works of Howells and Cable and of several dramas and comedies. He died on May 31, 1908.

Fred'erick I, called Barbarossa or Red-Beard, was born about 1123, and became emperor of Germany in 1152. His reign was a long struggle with powerful vassals at home and with Lombardy and the pope in Italy. He captured Milan in 1162, and took Rome by storm five years later. His army was, however, smitten with the plague, and Lombardy again revolted; and in 1176 he was defeated at Legnano. At home he managed his vassals by conciliation and by keeping the balance of power among them equal. He asserted his power, moreover, over Poland, Hungary, Denmark and Burgundy. At the height of his fame and influence he took the cross to fight against Saladin. He defeated the Mohammedans in two battles, but was himself drowned in Pisidia on June 10, 1190. The legends and songs of Germany still cling about the memory of Frederick Barbarossa.

Frederick III, second German emperor and eighth king of Prussia, was born at Potsdam, Oct. 18, 1831, and was in early life educated to the profession of arms. After leaving Bonn University he studied the art of war under Moltke. In January, 1858, he married the princess-royal of England. He took a prominent part in the War with Austria and in the Franco-Prussian War; for his services in the latter campaign he was made a field-marshal. In 1887 he showed signs of suffering from a throat trouble, and was operated upon in February, 1888, without success. On the 9th of March Emperor William I died, and Frederick ascended the throne as Frederick III. His throat continued to trouble him, and, despite all that medical science could do for him, he died on June 15, 1888.

FREDERICK III

Frederick I, king of Prussia and third elector of Brandenburg of that name, was born at Königsberg, July 11, 1657. He succeeded to the electorate in 1688, and on Jan. 18, 1701, elevated himself to the dignity of a king. He gave valuable support to William of Orange in his attempt on England, and characterized his reign by advancing the arts and sciences. Frederick died on Feb. 25, 1713, and was succeeded by his son, Frederick William I.

Frederick II of Prussia, better known as Frederick the Great was born at Berlin, Jan. 24, 1712. His early education was directed by military men, and its narrowness forced him into frequent open rebellion. When but eighteen he attempted to escape to England, but was unsuccessful; his father looked upon this act as military insubordination and political rebellion, and punished him with close confinement at Küstrin, where he remained until 1733, when, shortly after his liberation, he married Princess Elizabeth Christina of Brunswick. Until 1740 he devoted his leisure time to the study of music and French literature, and then began to manifest signs of political ambition. On May 31 of that year he became king, and in the following December entered into a war with Austria, putting forward as a reason an old claim upon the province of Silesia. He twice defeated the Austrians, and by the treaty of Breslau, June, 1742, was awarded Upper and Lower Silesia. He again added to his territories as the result of a second Silesian War (August, 1744, to December, 1745), and after eleven years of peace he began a Silesian campaign (1756), better known as the Seven Years' War. In 1772 he added Polish Prussia and a large part of Great Poland to the Prussian crown. He died at Potsdam, Aug. 17, 1786. His military achievements gave him fame as a great military leader, whence his title of Frederick the Great. He was very popular among his people with whom he was extremely democratic. See Carlyle's *History of Frederick II*.

Frederick Charles, a Prussian prince known as the Red Prince from the color of his favorite hussar-uniform, was born at Berlin, March 20, 1828. He was educated for the army, and saw service in the Schleswig-Holstein War and in the second Danish War; while in the Austrian War he won the great victory of Königgratz. In the Franco-Prussian War he commanded the second army, drove Bazaine back to Metz, and compelled that fortress to surrender on Oct. 27, 1870. He was one of the ablest of Prussian generals. He died June 15, 1885.

Frederick William, elector of Brandenburg, commonly called the Great Elector, was born on Feb. 16, 1620, succeeded to the electorate in 1640, and died on April 29, 1688. On his accession, he found an empty treasury and general devastation on account of the Thirty Years' War. He instituted a policy of peace, and devoted himself to consolidating his dominions; and when he died, he left a well-filled treasury and a highly-organized army. He was succeeded by his son, Frederick III, afterward King Frederick I of Prussia.

Frederick William I, king of Prussia, was born at Berlin, Aug. 15, 1688. The greater part of his reign (1713–40) was devoted to the improving of Prussia's internal condition, and the result of his policy was seen at his death, which occurred on May 31, 1740, when he left to his son a treasure of $6,750,000 and an army of 80,000 men, at that time the best-drilled force in Europe.

Frederick William IV, king of Prussia, was born Oct. 15, 1795. His reign (1840–61) was one long struggle of the people of Prussia against their king for a constitutional form of government. At length, on Jan. 31, 1850, the country was granted a representative parliament. He died on Jan. 2, 1861, being succeeded by his brother, Emperor William I of Germany.

Frederick, Md., a city and county-seat of Frederick County, 62 miles from Baltimore. It is the scene of Whittier's poem *Barbara Frietchie*, and its importance is chiefly historical. Twice during the Civil War it was occupied by the Confederates. The second time, in 1864, General Early demanded a large ransom, which was paid. General McClellan with Federal troops occupied the city in 1862. Frederick has manufactories of leather, brushes, knit-goods, shirt-waists, tobacco, etc., besides canning-factories, iron foundries, flour and planing-mills. Here are located the State School for Deaf and Dumb, Frederick College, Hood College and Hood Seminary. It is served by the Pennsylvania and Baltimore and Ohio railways. Population, 10,886.

Fred'ericksburg, Battle of, was one of the great battles of the American Civil War, in which the Union forces sustained a defeat. General Burnside divided his command into three divisions, and advanced to Falmouth opposite Fredericksburg, Va. Before the head of his column had crossed the Rappahannock, Lee had fortified the heights in rear of the town, and so harassed the Union forces that it took two days to cross. On Dec. 13, 1862, Burnside moved to the attack, but was forced to retire. Next day he wished to renew the attack, but was persuaded not to do so, and on the night of the 15th, under cover of a storm, what remained of the Union army was brought back to Falmouth. Burnside lost 12,321 men, while the Confederate loss was 5,309 men. Burnside, a week later, was relieved of his command, and General Hooker was appointed to succeed him.

Fred'ericton is the capital of New Brunswick, and is situated on the right bank of St. John River, 85 miles from its mouth, at the head of navigation. Population 7,500. Its chief business is lumbering. The normal school, the Canadian School of Infantry and the Parliament-buildings of the province are located here.

Free'man, Edward Augustus, one of the most learned of English historians, was born in 1823, at Harborne, Staffordshire; and died in Spain on March 16, 1892. He studied at Trinity College, Oxford, and in 1845 became a fellow of that college. He was a master of research, as is seen in his works, some of the best known being *A History of the Saracens; History of the Norman Conquest;* and *The Ottoman Power in Europe.* During 1881-82 he traveled in the United States, and on his return to England published *Some Impressions of the United States.* With his appointment as regius professor of modern history at Oxford, Freeman's industry was greatly whetted, and he became a voluminous writer. Besides his historical works, he wrote largely on antiquarian and topographical subjects as well as on architecture, and on comparative politics. He also published useful textbooks of historical nature, as *Old English History; General Sketch of European History; Historical Essays; History of Sicily; Methods of Historical Study; Historical Geography of Europe William the Conqueror,* and *Sicily: Phœnician, Greek and Roman.*

Freeman, Mary Eleanor Wilkins, American authoress, was born at Randolph, Mass., in 1862, and in 1902 married Charles Freeman. She has written largely on New England life. Her chief works, besides poems, short stories etc., contributed to magazines, embrace *Jane Field; A New England Nun; Giles Corey, Yeoman; Young Lucretia; The Wind in the Rosebush; The Givers:* and *By the Light of her Soul.*

Free'masons are members of a secret society, the origin of which has by tradition been variously traced back to the Knights Templars, the old Roman empire, the Pharaohs, Hiram of Tyre, the Temple of Solomon or even to the times of the Tower of Babel and of the Ark of Noah. In reality the craft sprang into being from the same causes and reasons as other incorporated crafts. Their vocation as hewers and setters of stone compelled masons to travel from place to place in search of work. In order that they might be accepted as skilled workmen by their brother craftsmen, without the necessity of showing their skill, they made use of signs and words which they kept secret. Scotland possesses the earliest record of the presence of masons in lodges, tracing their origin to the foreign masons who came to Scotland in the 12th century to build the abbeys of Holyrood, Kilwinning and Melrose. The masons of England date back to 926, when King Athelstan held a meeting of masons at York. Modern freemasonry was introduced into America in 1730, into France in 1725, Russia in 1731 and Germany in 1740. There are over 48 grand lodges, exercising control over nearly 10,000 lodges in the United States, and nowhere is masonry held in greater honor or importance. The total membership in the lodges of the United States and British America for 1907 was 1,188,566. A set of passwords and a peculiar grip of the hand enable the initiated to recognize each other A great benefit derived from membership in the order is that it enables a mason where he is a stranger to make himself known to his brother-masons and claim their protection. See J. Fellowes' *Mysteries of Freemasonry*.

Freeport, Ill., county-seat of Stephenson County, is situated on the Pecatonica River. It is 113 miles west of Chicago, on the main line of the Illinois Central and three other roads, besides having several interurban lines. There are automobile, buggy, gas-engine, and novelty manufactures, and also the largest windmill factory in the world. Freeport has a large number of churches, nine public schools employing 95 teachers and enrolling 3,100 pupils and a Y. M. C. A. building costing $150,000. There are two daily, three weekly papers and six banks. Population, 20,000.

Free Trade is the name applied to a certain policy of a government in regard to foreign trade. Its main feature is that no duties are placed on imported foreign products. The opposite theory is protection, and its supporters believe that a nation grows and gains wealth faster by taxing imports and so "protecting" its own manufactures and other products. England has for years been the leading free-trade country, having become such under the leadership of Richard Cobden; while a Scotchman, Adam Smith, the apostle of free trade, has done more than any other to promote the belief in free trade by his famous book, *The Wealth of Nations*. The United States, France and Germany are the foremost protection countries, and France is the most highly protected nation in the world. At the present time the idea of protection seems to be gaining ground throughout the world, though in the United States there have not only always been many free traders, but there are more who believe in it now than ever before. See PROTECTION. See, also, Adam Smith's *Wealth of Nations;* Fawcett's *Free Trade and Protection;* John Morley's *Life of Cobden;* and Carey's *Principles of Social Science*.

Freischütz, Der. Opera in three acts; words by Kind; music by Weber. First produced at Berlin, June 18, 1821. Notable as the most complete early embodiment of the ideals of the romantic school of opera. It deals with the supernatural in connection with a simple love-story. The overture — a great favorite in the concert-room — introduces the principal themes of the opera, and ranks among the finest examples of the so-called program overture.

Frémont', John Charles, an American explorer and general, was born at Savannah, Ga., Jan. 21, 1813. In 1835 he was professor of mathematics in the navy, but soon became a civil engineer and was employed in surveys by the United States government. He explored the Rocky Mountains, and proved the possibility of an overland route to the western coast of America. The highest peak of the Wind River Mountains, 13,570 feet high which he ascended, is named after him as Frémont's Peak. He crossed the South Pass, explored Great Salt Lake and went as far as Fort Vancouver, at the mouth of the Columbia. He forced a passage in the winter over the snow-covered mountains into California, reaching Sacramento in March with his men reduced to skeletons. In the spring of 1845 he set out again to explore the country between the Mississippi and the Pacific. This journey probably gave California to the Union, as he found the Mexican troops marching against the settlers

JOHN C. FRÉMONT

to drive them out, and he joined with the settlers against them and defeated them. The Americans declared themselves independent, and made Frémont governor. He was sent to Congress as senator from California in 1850. He was the Republican candidate for the presidency in 1856. In the Civil War he served for two years as a major-general. He also was governor of Arizona from 1878 to 1881. He died at New York, July 13, 1890. His services as an explorer were rewarded by a gold medal from the king of Prussia, with the founder's medal of the Royal Geographical Society of London and with membership in the Geographical Society of Berlin. See *Life* by Mrs. J. C. Frémont, the brilliant daughter of the famous Senator Benton of Missouri.

Fremont, Ohio, city, county-seat of Sandusky County on Sandusky River, 30 miles east of Toledo. It is in the center of an agricultural, oil and natural-gas region. Agricultural implements, cutlery, machinery, electro-carbons, woolens, beet-sugar, doors, sashes etc., are manufactured here. The city has good public schools, business colleges, a normal school and Birchard Public Library, founded by an uncle of President Hayes. Fremont has all the equipment of a progressive city, is served by three railroads, and has steamer-connection with all important ports on Lake Erie, with which it conducts much business. The city occupies the site of a tradingpost established in 1785, and was given its present name in 1850 in honor of J. C. Frémont. Population 9,939.

French, Alice, American authoress, known also by her pen-name, Octave Thanet, was born at Andover, Mass., March 19, 1850, and educated at Abbott Academy there. She began to write about 1878, her earliest productions being short stories illustrating western and southern life, with which she is familiar. Her chief books are *Knitters in the Sun; Stories of a Western Town; The Heart of Toil;* etc.

French and Indian Wars, 1689–1763. Under this term are included the four intercolonial wars of the 17th and 18th centuries in America, known as King William's War, Queen Anne's War, King George's War and the specifically-entitled French and Indian War — all of them conflicts with the French and Indians of Canada (New France). The last of the series, however (which is coincident with the Seven Years' War in Europe), is especially characterized in the American colonies by the designation of the French and Indian War, which comprised the period between 1755 and 1763.

This grand struggle was inevitable from the conflicting character of the respective governments England had settled the eastern coast, and claimed the territory from the Atlantic to the Pacific. The French had occupied the valley of the St. Lawrence, and, exploring westward along the Great Lakes, had followed the Wabash and Illinois Rivers to the Mississippi and thence down the great valley to the Gulf. These explorations were carried on chiefly by the Jesuit missionaries, who with unflagging energy and at the greatest personal risk, pushed far into the wilderness to establish missions among the Indians. In 1673 Father Marquette, a missionary, and Joliet, a trader, together passed down the Wisconsin River to the Mississippi and thence down that river to the Arkansas. La Salle, the most indefatigable of these explorers, received from the French king a tract of land adjoining Fort Frontenac, in recognition of his services in exploring Lakes Erie and Ontario. He then pushed westward through the Great Lakes, explored the Illinois and descended the Mississippi to the Gulf. On the line of these explorations the French had, in 1750, established 60 small military and trading-posts, stretching along the lakes and down the Maumee, the Wabash, the Illinois and the Mississippi to New Orleans. They had also traversed the country to the headwaters of the Ohio. They had thus taken formal possession of this vast country, while but little had been done in the way of colonization.

Thus far no conflict had occurred, because the English had not yet pushed their way west of the Alleghanies upon disputed territory. But in 1749 a corporation called The Ohio Company received from the king a grant of land west of the Alleghanies, along the Ohio, and opened traffic with the Indians. The French promptly resented the infringement upon their claims. The governor of Canada sent 300 men into the valley, who drove off the traders. In 1753 the French built three forts at Presque Island on Lake Erie, Fort Bœuf a short distance south and Fort Venango on the Alleghany River. Governor Dinwiddie of Virginia sent George Washington, then 21, with a message to the French General St. Pierre, in command of these forts, setting forth the claim of Virginia to the territory west of the Alleghanies and remonstrating against its occupancy by the French. Washington was courteously received, but the French commander positively declined to consider the claims of Dinwiddie. In 1754 the Ohio company built a blockhouse on the present site of Pittsburg. This was soon captured by the French, who proceeded to build Fort Duquesne on the same site. Meantime a force of 600 Virginians under Colonel Fry, Washington being second in command, were on their way to the same point. While *en rout* Colonel Fry died, leaving Washington in command. At Great Meadows, within 50

miles of Fort Duquesne, learning that a French force was marching against him, he built a stockade which he named Fort Necessity. Here, on the third of July, he was attacked by the French General De Villiers with a force of 1,500 French and Indians, and after a stubborn defense was compelled to surrender.

Meantime the English government made active preparation for war. In February, 1755, General Braddock arrived with two regiments of troops. To these were added a small body of militia, and with this force he marched in April through the wilderness against Fort Duquesne. On the 9th of July Braddock was met and defeated by a large force of French and Indians, himself falling mortally wounded. A second expedition under Governor Shirley, which was sent from Albany against Fort Niagara, returned without attempting to capture it. Governor Johnson of New York, in command of a militia force, marched against Crown Point. He built Fort Edward on the Hudson, and, proceeding, met and defeated a force of French and Indians under General Dieskau, who was killed. Johnson went no further, but here built a fort which he named Fort William Henry. A fourth expedition was sent by Governor Lawrence of Massachusetts to attack the French forts on the Bay of Fundy. These they captured with little resistance, and the whole country of Nova Scotia or Acadia fell into their hands. The English were here guilty of a great piece of cruelty. The country was laid waste and the inhabitants, simple French peasants who had taken no part in the war, were driven into exile at the point of the bayonet.

The events narrated cover the operations of 1755. The plan of operations for 1756 covered the same points, viz., the capture of Forts Duquesne, Niagara and Crown Point. Not one of these objects was accomplished. On the other hand the French, led by Marquis de Montcalm, a successor of Dieskau, captured Oswego. A fleet of vessels, 135 cannon and 1,500 prisoners fell into his hands. During the summer the settlements in western Pennsylvania and Virginia were ravaged by Indians, who killed and captured large numbers of settlers. They were finally defeated with great loss in a battle near the Indian town of Kittanning. In 1757 but one expedition was undertaken by the English. Lord Loudon, who had been appointed commander-in-chief of the British forces, sailed against the fortress of Louisbourg with an army of 6,000 regulars. A fleet under Admiral Holbourn, with 5,000 men, joined him at Halifax. Learning that the garrison at Louisbourg had been reinforced, Loudon sailed back to New York without firing a gun. Meanwhile Montcalm appeared before Fort William Henry with a force of 5,000 French and Indians. After a brave defense of six days the garrison under Colonel Monroe was compelled to surrender. Montcalm destroyed the fort and returned to Crown Point.

At the close of this year — the third since hostilities began — the advantage rested decidedly with the French. The English had accomplished little, and had been driven back at the points of chief importance. With the opening of 1758 the government of England made preparations for a vigorous campaign. Twenty-two thousand troops were sent from England; the colonies furnished 28,000 militia. General Abercrombie was appointed to succeed Lord Loudon as commander-in-chief, with an able corps of subordinates, including young Lord Howe, General Amherst and General James Wolfe. Expeditions were planned against Louisbourg, Ticonderoga and Duquesne. General Amherst with a force of 10,000 men captured Louisbourg on July 28, with nearly 6,000 prisoners. Cape Breton and Prince Edward Island passed under English control. The attack on Ticonderoga was conducted by General Abercrombie at the head of 15,000 men. The English were repulsed after four hours' hard fighting, with a loss of 2,000 in killed and wounded. The English fell back to Fort George. Colonel Bradstreet was sent with 3,000 men against Fort Frontenac (Kingston) on Lake Ontario. He captured the place after a siege of two days. This success proved to have an important bearing on the capture of Fort Duquesne, which was abandoned by the French and was occupied by Virginian troops under Washington on Nov 25.

The year 1759 opened with the advantage greatly on the side of the English. Their combined forces numbered nearly 50,000 men against 7,000 on the side of the French. Three expeditions were planned, one against Niagara, a second against Ticonderoga and Crown Point and a third against Quebec. Niagara was captured by Sir William Johnson, who took the place, after severe fighting, on July 25. In the same month General Amherst, with 11,000 men, marched against Ticonderoga. On his approach the place was abandoned by the garrison, who retired to Crown Point. This place also was abandoned five days later, and was occupied by the English. Thus these important positions fell without a struggle. Wolfe commanded the expedition against Quebec, where, on Sept. 13, occurred the most desperate and the decisive battle of the war, resulting in the defeat of the French. Wolfe was killed and Montcalm, the French commander was mortally wounded at the city's gate. Four days later the city and fortress were surrendered to the English. In September, 1760, Montreal surrendered. This was the last point of importance held

by the French, and with it Canada passed into the possession of Great Britain.

The war between England and France ended with the treaty of Paris of 1763. France surrendered all her possessions east of the Mississippi, except the Island of Orleans. At the same time Florida was ceded to England by Spain. The possessions of England in America were now 20 times greater than when the war began. The Indian tribes, which had been allied with the French, refused to submit to English authority. In 1763 a formidable league was formed under the leadership of Pontiac, a famous Ottawa chief. The country west of Niagara was devastated. All the British posts, excepting Detroit and Fort Pitt, were captured and the settlements blotted out. Next year a strong force was sent against the Indians, and they were reduced to submission.

French Congo, a possession of France in west-central Africa, situated between German Kamerun, Congo Free State and Lake Chad, Kanem and Wadai. The French were among the earliest explorers of the Congo region, and M. di Brazza, the Italian explorer, obtained large tracts of land from the native chiefs for France. French Congo lies on the northern bank of the Congo River, between the river and the Atlantic, including the region around Ubanghi River. Area about 680,000 square miles. Population estimated at 5,000,000. The capital, Libreville, has a population of 3,000; other towns are Loango, Franceville, Brazzaville and Fort de Possel. French Congo is divided into three colonies, under lieutenant-governors, with a general budget for the whole. The colonies are Gabun (capital Libreville); Middle Congo (capital Brazzaville); and Ubangi-Shari-Chad (capital Fort de Possel). The mineral resources embrace gold, copper and iron; while its exports (amounting in 1904 to about 14,000,000 francs) consist of rubber, ivory, various woods, palm-oil and kernels, coffee, cocoa, kola-nuts etc. There is considerable shipping-trade at Loango, but inland trade is hindered by lack of railways, though a line is projected to connect Libreville and the Congo. Brazzaville is connected with Loango by telegraph (715 miles), and another is being put up to connect with Leopoldville in Belgian Congo.

French Guinea. Lying between Portuguese Guinea on the north and Sierra Leone on the south, this French possession extends inland with a total area of 95,000 square miles and a population estimated at 1,498,000. The colony is self-supporting, the income and outgo balancing in 1907 at 5,300,000 francs. In 1905 the imports amounted to 18,924,814 francs, and the exports to 16,373,661 francs, these consisting chiefly of rubber, cattle and palm-nuts. A road has been driven from Konakry, the capital, to the Niger at Kurussa, and a railway has followed it as far as Kindia, 83 miles. There are 1,060 miles of telegraph. As elsewhere in French West Africa, governmental lay-schools are taking the place of those under the care of religious orders. French colonization began in 1685, but official occupancy by France did not occur till 1843.

French Language, The, is a development from the Latin spoken by the Romans who had conquered Gaul in the first century B. C. under Julius Cæsar. This Latin was not classical Latin, nor even the speech of the cities, but the more corrupt *patois* of the camps and rural districts. An undefined proportion of Celtic words was adopted into the rustic Latin, and thence found a path to modern French. In the fifth century, too, a Teutonic race known as the Franks overran and conquered Gaul, which had been completely Romanized. The conquerors, indeed, adopted the spoken Latin, but introduced about 400 Teutonic words. A few Greek words came into the French language from the Greek colonies at Marseilles and Nice. Thus in the seventh century the language of France had come to differ widely from Latin. It was now called Romanic.

The development of the French language now bifurcated into two parts. The French of the north was called the *langue d'oïl*, that of the south the *langue d'oc*. These two words, *oïl* and *oc*, meant *yes* in the north and south respectively. The *langue d'oc* developed into modern Provençal; the *langue d'oïl* into modern literary French. The former tongue achieved a wide celebrity during the 12th century as the language of the troubadours. New words were drawn into the French language during and preceding the Renaissance by almost direct adoption from the Latin. Italian and Spanish have each contributed several hundreds of words to French. The French language is now standardized and modified by the famous *Académie Française*, founded in 1635 and suppressed (for but a short time) in 1793. The chief recent modifications of the French language have been caused by an influx of scientific terms, largely Greek, and another influx of borrowed English words.

French Literature. See LITERATURE.

French Military Territories were three in number, but in 1904 were broken up. The second was handed over to the civil administration, the third and first amalgamated as the military territory of the Niger. See UPPER SENEGAL AND NIGER COLONY.

French Oceania. See NEW CALEDONIA and SOCIETY ISLANDS.

French Field Marshal Viscount, British soldier who distinguished himself in the Egyptian campaign (1884–85,) the Boer War (1899–1901), and the European War (1914–18).

He was born at Ripple in Kent on Sept. 28 1852, and early entered the navy, but exchanged into the army (1874), where he became noted as an excellent cavalry-officer. Before the outbreak of the Boer War (October, 1899) he was in command of the cavalry brigade at Aldershot, which he resigned to accompany Redvers Buller to take command of the British cavalry in Natal. He fought the battle of Elandslaagte, and later, under Lord Roberts in Orange River Colony, he raised the siege of Kimberley. In the European War (*q. v.*) he commanded England's first expeditionary force and was given the title of Viscount French of Ypres for his services in that battle.

French Revolution, The, a period in France, in the latter years of the 18th century (specifically between 1789 and 1795), of wild tumult and revolt, marked in the capital by the ungovernable and unnatural excess of a frenzied populace. The occasion of the violent outbreak was the effort of the nation, represented by the Third Estate in the states-general, which was convened in May, 1789, to free itself from absolutism in the monarchy and to secure the abolition of the privileged classes and of all the caste distictions and feudal abuses; the reform of the church; the reorganization of the national finances; and the reconstitution of the government. These things occurred when Louis XVI was king, surrounded by an extravagant and profligate court and by a corrupt and licentious nobility. The king, who had come to the throne in 1774, though well-meaning and recognizing the need of economy and reform, was weak and wanting in firmness for so new and exacting a situation. The financial situation, grappled with by Necker, might itself have been remedied but for the unwise interference of the king. Necker finally demanded the convocation of the states-general, which had not met since 1614. They met on the 5th of May, 1789, but as the nobles and clergy refused to recognize the Third Estate properly, the deputies of this body assumed the title of the national constitutent assembly and proposed to give France a constitution. The clergy and nobles yielded; foreign troops were brought to Paris; but the people flew to arms, and on the 14th of July the Bastille was captured and destroyed. On the fifth of October Versailles was attacked by the mob and the royal family were taken to Paris, virtually prisoners. A new constitution formed by the assembly was sworn to by the king on the 14th of September. This constitution deprived the king of arbitrary powers, providing liberty of worship and freedom of the press, of commerce and of industry. In accordance with the constitution the legislative assembly succeeded the constitutent assembly, meeting on Oct. 1, 1791. In this body there were two parties, the Girondists, moderate republicans, and the Montagnards, extreme radicals. The monarchists already were powerless. Threats of foreign intervention on behalf of the king led to a declaration of war against Austria and Prussia, April 20, 1792. With French reverses came a popular uprising, and the Tuileries, after a bloody combat, was taken and sacked. A national convention was convened in place of the assembly, and its first act was to proclaim a republic. The king was sentenced to death and was executed on Jan. 21, 1793. A committee of public safety, with sovereign authority, was appointed, and the Reign of Terror was begun. The Montagnards or Jacobins came into power, Christianity was formally abolished, opposing factions were put down with frightful bloodshed, the queen was executed on Oct. 16, 1793, the Girondists on Oct. 31, and the bloody work went on under the leadership of Robespierre. The Reign of Terror finally came to an end by the execution of Robespierre and his associates, July 27 and 28, 1794. In 1795 the convention gave the republic a new constitution and was dissolved on Oct. 26. Then arose Bonaparte and the diversion of the national mind by the campaign in Italy and the expedition to Egypt. The era closed with the return to France of the future idol of the nation, the rise of the consulate and, finally, the establishment of the empire.

French Somali Coast or **Protectorate.** See SOMALILAND.

French West Africa has had one general government since Oct. 1, 1902, being divided into the colonies of Senegal, French Guinea, the Ivory Coast and Dahomey and the territories of Senegal and the Niger, each of which is treated independently. Each colony has a lieutenant-governor under the governor-general of the entire tract, assisted by a secretary-general and a permanent delegate situated at Dakar. With the divisions mentioned are to be included the territories of the Upper Senegal, of the Middle Niger, and the Military Territory, toward which each of the four colonies contributes. In 1907 France expended 15,813,115 francs, most of it for military purposes. A loan of 65,000,000 francs has been contracted, the money to be spent in railways, harbors and sanitary work. Great Britain has ceded a port accessible to sea-going vessels on the Gambia, as well as the Los Islands, formerly belonging to Sierra Leone. By the convention of 1904 about 8,000 square miles had been taken from British and added to French territory, giving a better route from the Niger region to Zinder and Lake Chad.

Frere (*frâr*), Pierre Edouard, a French painter, was born at Paris, Jan. 10, 1819. He studied under Delaroche. His paintings are mostly figures and scenes from domestic life. They are good subjects for engraving,

and are well known in art-stores. Ruskin was enthusiastic in praise of several of his works, which were shown in the French gallery in 1857. The *Seamstress, Little Gourmand, Preparing for Church* and the *Gleaner Boy* are among his best-known pictures. *Preparing for Church* is in Corcoran Gallery at Washington. He died on May 23, 1886.

Fresnel (*frā'nĕl'*), **Augustin Jean,** a French engineer distinguished as the principal founder of the modern wave-theory of light, was born in Normandy in 1788 and died near Paris in 1827. As a child he was not considered brilliant, but, nevertheless, he was ready to enter the Polytechnic school in Paris at 16. In 1816, through the influence of Arago, he received an appointment in Paris, where he remained during the rest of his life. When we recall that his first studies in optics date from 1814, his accomplishments during the 11 years of his Paris residence almost surpass belief. The great advances which he made over Grimaldi, Hooke, Huygens, Young and other advocates of the wave-theory consist in the introduction of the idea of transverse vibrations in the ether and in the combination of the principle of Huygens with that of interference. Fresnel's works were published in 1866 by the French government in three superb quartos.

Fresno, Cal., county-seat of Fresno County, on the S. P. and S. F. railways, is 15 miles west of San Joaquin River and in the exact center of San Joaquin Valley, the greatest raisin and grape producing region in the world. The value of the former crop is six millions annually. There are nearly 125,000 acres of grape vines in the county. Smyrna figs are also grown with success. Fresno is 200 miles southeast of San Francisco and is one of the best-equipped and most up-to-date of all the provincial cities of the state. The population is 48,000.

Freytag (*frītäg*), **Gustav,** a German novelist and play-writer, was born in Silesia, July 13, 1816, and died at Wiesbaden, April 30, 1895. He studied at Breslau and Berlin, and lectured on German literature in the University of Breslau. He edited a newspaper at Leipsic, and held a court-position at Gotha. He wrote poems, successful plays and novels. His best-known work is *Debit and Credit,* which has appeared in several English translations. *The Lost Manuscript* and a series called *Our Ancestors* were nearly as popular, while the plays, *The Valentine* and *Count Waldemar,* were brilliant successes.

Frick, Henry Clay, capitalist and manufacturer, was born at West Overton, Pa., on Dec. 19, 1849. He completed his education at Otterbein University, Ohio, and in 1869 accepted a position as bookkeeper in his grandfather's office at Broad Ford, Pa., where he soon became interested in the coking-coal deposits of that vicinity. He formed a company to buy 300 acres of coke-lands and start coke-ovens. The business grew rapidly, and he used the profits to buy more coke-and-coal lands. By 1882 the capital of this company, which bears his name, had been increased to $10,000,000. It now is probably the largest producer of coke in the world, and owns 40,000 acres of coal-lands.

In 1892 Mr. Frick became president of the Carnegie Steel Company, when it had a capital of $25,000,000. In that year much trouble was caused by a strike of its employees, in connection with which he was shot and stabbed by an anarchist. He recovered, however; carried the day against the strikers; and by his firmness, decision and fairness so won their approval that there was after that time very little labor-trouble in the companies with which he was connected. For several years preceding his death, December 2, 1919, he had retired from active business.

Friendly Islands or **Tonga Group** lie 250 miles southeast of Fiji. The total area is only 390 square miles. Most of the islands are coral formations, but some are volcanic. There are several active volcanos. Earthquakes are frequent. The islands were discovered by Tasman in 1643, and named by Cook in 1777. Among the products are tropical fruits, copra, coffee, sponges and cocoanuts. The native animals are few. Missionary work on the islands has, since 1827, been done by the Methodists. Almost all the islanders are Christians; many can speak English; and schools are numerous. The people are in many ways superior to the other South Sea islanders. But they are decreasing in numbers and have dwindled to 23,011. Since 1845 the islands have been under the rule of one chief, and they have a constitution and a parliament. By agreement of the European powers in 1896 the islands were allowed to remain neutral; but British interests have long been predominant, and the islands are a protectorate of Great Britain. The protectorate was declared in 1899, and in 1904 the British High Commissioner assumed control of the legal and financial administration. The revenue, chiefly derived from customs, amounted in 1910 to about $220,000, while the expenditures were $213,000. The trade (import and export) is chiefly with New Zealand, New South Wales and Great Britain. Two ships of the New Zealand Union Company visit the group every four weeks, between Auckland and Tonga, Samoa, Fiji and Sydney. See H. S. Cooper's *Coral Islands.*

Friends, Society of. See QUAKERS.

Frigate-Bird, a sea-bird related to the pelicans, because of its warlike attitude toward other birds is known as the man-of-

war bird, though this name is given also to the albatross (*q. v.*) and other birds. It is very large, the spread of wings sometimes being ten feet, and has an extremely long, forked tail and a bill five inches long, hooked at the end. It has a pouch, which is inflated in flight and becomes bright scarlet during the breeding-season. In color the bird is blackish-brown with green and purple reflections; the feathers are much in use for headdress in the Pacific islands. Throughout the tropic regions the bird is met with, and it has been known to wander as far north as Nova Scotia. It is a true ocean-bird, seldom coming to land except to roost on trees near the breeding-quarters. The slightly-built nest is placed in a tree or bush, occasionally on the ground or bare rock, and contains one egg. It is said that both male and female incubate, sitting close together and snapping at any intruder. The flight of the frigate-bird is wonderfully swift and long-sustained. The birds are usually seen singly or in pairs. They do not dive for their prey, but with ease seize the surface-swimming birds that constitute their chief food; they also feed on squids, small crabs, flying fish and young turtles. They are adept as robbers, forcing terns and boobies to give up their prey and catching it before it reaches the water. It has been asserted that they pass from Africa to South America in a day.

Fro'bisher, Sir Martin, one of the great seamen of the age of Elizabeth, was born in Yorkshire about 1535. Sent to sea as a boy, he formed, at an early age, his lifelong dream of a northwest passage to Cathay. Following out this idea, he made three voyages to the region of Labrador. Later on he commanded a vessel in Drake's expedition to the West Indies, and covered himself with glory by his conduct in the struggle with the Spanish Armada. His later years were spent in scouring the seas for the treasure-ships bound from the New World to Spain. At the siege of Croyzon, near Brest, in 1594, he was wounded, and died at Plymouth, England on Nov. 7 of the same year. See *Life* by Rev. F. Jones.

Froebel (*frē'bel*), **Friedrich Wilhelm August,** a German reformer in education, was born in Thuringia, April 21, 1782. His early years were spent partly in study and partly in teaching, for which he had a marvelous fitness. His underlying idea in education was to follow nature in the unfolding of the pupil's mind; letting it grow and expand as a plant grows, according to its nature This idea he had an opportunity to carry out, when, in 1817, he opened a school at Griesheim, in Thuringia, which he soon transferred to Keilhau. He wrote a work explaining his views, and, with the object of extending his system, started several branch-schools and began to train teachers. In 1836 Froebel opened at Blankenburg, not far from Keilhau, his first kindergarten, a system of teaching children which has since become popular in all circles of education. The remainder of his life was spent in working out this new system. Froebel has exerted a great influence on education in this country, perhaps greater than either Pestalozzi or Herbart. His principal work is *The Education of Man,* translated by Josephine Jarvis. He died on June 21, 1852. For kindergarten see SCHOOL; MODERN EDUCATION; CHILD-STUDY; SELF-ACTIVITY; GAMES.

Frog, a common, tailless amphibian, with webbed feet, and hind legs adapted for leaping; hatching as a tadpole and passing from

STAGES IN THE LIFE-HISTORY OF THE FROG

a water-breather to an air-breather. The frog belongs to the same group with toads, salamanders etc. Its life-history is very interesting, because it represents that phase of animal life through which the race of higher animals must have passed in changing from water-animals to land-animals. There is good reason to believe that animal-life began with aquatic animals and that the terrestrial animals sprang from them. As is well known to embryologists, all the higher animals pass through a stage, in the egg, in which they have rudimentary gill-slits and gill-arches, with blood vessels arranged on the fish-like pattern. (See DEVELOPMENT.) The frogs hatch at the level of a fish, and, while leading an independent life, they pass through the stages that higher animals pass before birth. Frogs and toads are much alike; in the

tadpole stage they live on vegetable matter, but, after the metamorphosis, catch insects, slugs etc. by a long, flexible tongue. When first hatched, the young tadpole has external, feather-like gills. Soon these disappear, and then internal gills are used in breathing. Then fore and hind limbs make their appearance, and the tadpole is a tailed frog. The tail disappears gradually; it does not drop off nor simply shrivel, but is used as food by the growing animal. Numerous, white blood-corpuscles creep through its substance, and carry minute portions of it forward for the nourishment of the animal, and thus it is gradually consumed. In the meantime great changes have been taking place in the internal organs — the lungs are developed, the system of blood-vessels is changed and the digestive system is made over into one fitted for animal food. The changes in the blood-system are very remarkable. Aortic arches disappear, and the heart changes from a fish-like heart, with auricle and ventricle, to an amphibian heart, with three chambers, intermediate between the fish-heart and the four-chambered heart of the higher animals. The largest frog in the United States is the bullfrog, which measures, when extended, 18 to 21 inches. The hind-limbs of frogs are much eaten as delicacies. See Marshall's *The Frog* and Dickerson's *The Frog Book.*

Froissart (*froi'särt*), **Jean,** a historian of the middle ages, was born at Valenciennes, France, about 1337. He was educated for the church, but spent his youth in gayety and dissipation. When 20 years old, he began his famous *Chronicle* or *History.* After completing the first section of his work, Froissart set out on his protracted travels in quest of adventure and good company. He visited England, where he became the favorite of the wife of Edward III. He traveled through Scotland with only his riding-palfrey and a greyhound as companions, where he was entertained by King David Bruce and the Earl of Douglas. In the train of the Black Prince he journeyed to Aquitaine, and soon after he is found in Italy. He became a curate, and for a while settled down, but again gave way to the old roving impulse. He ended his days as canon at Chimay in 1410. His famous *Chronicle* deals with the period between 1326 and 1400; and, though mainly occupied with the affairs of France and England, Scotland and Flanders, he likewise gives much valuable information in regard to Germany, Italy and Spain. He gathered his materials in courts and on highways, from the lips of lords and knights, squires and heralds. He was a born story-teller, and his pages glow with color. His book is the most vivid and entertaining of all medieval chronicles. He was the Herodotus of the middle ages.

Frond (in plants), a name chiefly applied to the leaves of ferns, under the impression that they are not like ordinary leaves, but are a combination of stem and leaf. The word is passing into disuse.

Fron'tenac', Compte de, was born in France in 1620, and died in Quebec in 1698. Becoming brigadier at an early age, he was appointed governor of the French possessions in North America and remained for ten years. The Indians feared him, yet he won their respect. The settlers trusted him. Parkman narrates how he crushed the Iroquois and freed the colony from their lawlessness. No more interesting incidents can be referred to in early Canadian history than those suggested by the name of Frontenac. Frontenac, a nobleman of long descent, representing the most powerful court in Europe, adapted himself readily to the new-world environment. He would carry a pack over a portage or push a canoe through the rapids as skillfully as a native. He is entitled to first place in the list of French governors. His first glimpse of the Great Lakes kindled a desire to extend westward the influence of France. Frontenac County on the north shore of Lake Ontario is called after him. Speaking of Count Frontenac, one writer says: "He twice rescued the colony from the destruction that seemed inevitable and changed the course of New World history by stemming the hostile tide that threatened to sweep French settlers and French influence alike out of the St. Lawrence basin."

A plan of Fort Frontenac (at Kingston, Ontario) made in 1787 can be seen in Abbé Foillions' *History of Ville Marie* (Montreal). The fort there shown was destroyed in 1689 by Governor Denonville, and restored by Count Frontenac in 1695.

Frontenac County, on the north shore of Lake Ontario in the eastern part of Ontario, contains unsurpassed feldspar and mica-deposits, which extend to adjoining counties. A richly mineralized district, it possesses historical interest.

Frost, either the process of freezing or the crystals of frozen dew. These crystals are also called hoar frost. When air condenses at a temperature above freezing point (32° F.), the result is dew; but when the air contains so little water-vapor or is already at so low a temperature that condensation does not take place until the temperature is below freezing point, the result is frozen dew or frost. The most remarkable formations of frost are seen on the crest of Mount Washington during the autumn and winter, when crystals a foot or more in length fasten themselves to every object. The destructive effects of frost on tender plants are well-known. When plants radiate or pass off their heat faster than it can be supplied from the air around, they are frosted. This is most

liable to happen on clear nights, as the clouds act as a screen to check radiation. Smoke acts in the same way as clouds, so that frost is more common in country districts than in towns. A well-known form of frost is the frost-work or ice-crystals seen when the moisture in the air of a warm room condenses on the glass of the window, the glass being below freezing point. Black frost is the effect produced when the moisture within a plant is frozen, but without any hoar frost being formed on the outside.

Froude (*frōōd*), **James Anthony,** an English historian, was born at Dartington, Devonshire, April 23, 1818. His early literary work appeared largely as contributions to magazines; but in 1856 appeared the first volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada.* Later on he published four volumes of brilliant essays entitled *Short Studies on Great Subjects.* Among more recent works are a sketch of *Julius Cæsar* and *Oceana,* the latter an account of a voyage to Australia and some of the Pacific islands. In 1873–74 appeared *The English in Ireland in the Eighteenth Century.* Froude was for some years rector of St. Andrew's University and editor of *Fraser's Magazine.* In 1892 he was appointed regius professor of history at Oxford. Froude had fine literary ability, and in the art of making history as fascinating as fiction Macaulay is his only rival; but he lacked the critical fairness and accuracy of modern historians, a fault which greatly impairs the permanent value of his works. He died on Oct. 20, 1894.

JAMES A. FROUDE

Fruit. When seeds are formed, contiguous parts become more or less modified, and the resulting structure is called a fruit. The parts involved in a fruit vary widely in different plants. Sometimes only the ovary is involved, as in the bean-pod; sometimes the cup-like part of the flower which bears the floral leaves is included, as in the apple; sometimes the very much enlarged receptacle is included, as in the strawberry; while in the pineapple the fruit is the whole flower-cluster, with its axis, bracts, flowers and all. Fruits may be roughly classified in two groups: (1) those which ripen dry and (2) those which ripen fleshy. The dry fruits are further divided into those which dehisce, that is, open in some way to discharge the seeds, and those which do not dehisce, the fruit being carried away with the seed. Among dry fruits which do not dehisce are the akene (sometimes spelled achene), in which a single seed is so closely invested by the ovary as to make a seed-like fruit, as in the sunflower, dandelion, strawberry pits etc.; and the characteristic grain of wheat, corn and other cereals. Among dry fruits which dehisce, called in general pods, are the follicle, a single ripened carpel which splits down one side, as in the peony; the legume (generally called pod), a single ripened carpel which splits into two parts (valves), as

VARIOUS FORMS OF DRY, DEHISCENT FRUIT

in the pea and bean; the capsule, a ripened pistil of several carpels which opens in various ways, as in the hollyhock and violet; the silique, the peculiar pod of the mustard family, with a false partition; the silicle, a short silique; the pyxis, a capsule which opens by a lid, as in the twin-leaf (*Jeffersonia*). The fleshy fruits do not dehisce, and among them are the berry which is pulpy throughout and with a thin rind, as the grape, currant, tomato etc.; the drupe or stone fruit, in which the ovary wall develops an outer fleshy part and an inner bony part (stone), the seed being the kernel, as the peach, cherry, plum etc.; the drupelet, a small drupe, as the grains of the blackberry, raspberry etc.; the pome, in which certain flower-parts outside the ovary form the flesh, as the apple, pear etc., the ripened ovary being the core.

Fry, Elizabeth, was born on May 21, 1780, near Norfolk, the daughter of John Gurney, a banker. She had no deep religious opinions until, at 18, a sermon she heard in the Friends' meeting-house turned her thoughts in that direction. She began working among the poor, and founded a school for poor children, which she managed entirely herself, even when the number of scholars increased to more than 70. She married, and later became a preacher among the Friends. In 1813 she first saw the miserable condition of the 300 women,

Persimmon

Prune

Currant

Strawberry

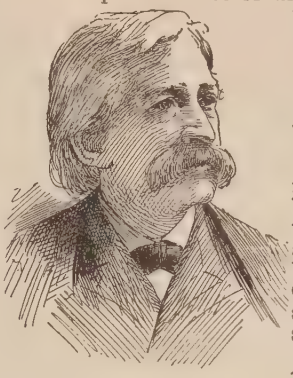
with their children, in Newgate Prison, and her attention was turned to prison-reform. By her efforts a school and manufactory were begun in the prison, an association formed to improve the prisoners and provide them with religious instruction, and a matron was appointed. Mrs. Fry visited prisons in different parts of Great Britain and on the European continent, everywhere effecting ameliorations. She died at Ramsgate, Oct. 12, 1845. See *Life* by Mrs. Pitman.

Fuegians (*fū-ē'jĭ-an*), or inhabitants of Tierra del Fuego are an interesting race, having a language or, rather, several languages different from all other known tongues. Several tribes are to be distinguished among them, including the Ona in the northwest, the Aliculuf in the center and the almost extinct Yahgans. All these tribes are ill-clothed and sheltered, yet skilled in basketry and in the making of weapons and canoes. It is likely that they will before long be extinct, for the owners and herdsmen of sheep are making sad havoc among them.

Fugitive-Slave Laws, The, were laws formerly in force in the United States to enable slave-owners to reclaim slaves who had escaped from them into another state. As slavery was a state affair, being recognized in some states and not in others, the logical outcome seemed to be that a slave ceased to be a slave when he entered a state in which slavery was not tolerated. This was true, unless one held strictly to the view that a slave was simply the private property of the owner, in which case the private property could be recovered through the intervention of Federal officials. On the assumption that a slave was private property, the Fugitive-Slave bill of 1793 was passed, giving the alleged owner the right to seize a person whom he could prove, before judge or local magistrate, to be his fugitive slave, and remove him to his own state. This law was much abused by kidnappers of free negroes, since a negro so seized was practically at the mercy of one who was willing to swear that he was his escaped slave, and the alleged slave was debarred from the right to demand a writ of *habeas-corpus* or a trial by jury.

Meanwhile states prohibiting slavery in some instances passed laws with a view to nullifying the laws permitting slave-extradition in this fashion, on the ground that state laws were here supreme. This led to much agitation on the part of slave-owners, and led to the passing of the Federal law of 1850 which denied the right of a slave to a writ of *habeas-corpus* or a trial by jury, and placed the enforcement of the law entirely in the hands of the officials of the Federal government. This second fugitive-slave law was repealed in 1864.

Fuller, Melville Weston, chief-justice of the supreme court of the United States, was born at Augusta, Me., Feb. 11, 1833, and graduated from Bowdoin College and Harvard Law School. In 1855 he was admitted to the bar and practiced for a time at Augusta, Me., but removed to Chicago and pursued his profession there until 1888, when he took the oath of office as chief-justice, the post being offered him by President Cleveland. In the sixties he was a member of the Illinois state legislature, and was repeatedly delegate to the Democratic national conventions. Bowdoin College, Northwestern University and Harvard each conferred upon him the honorary degree of LL.D. He died July 4, 1911.



MELVILLE W. FULLER

Fuller, Sarah Margaret, Marchioness Ossoli, an American author, was born at Cambridgeport, Mass., May 23, 1810. After the death of her father, a lawyer and congressman, she supported herself for some time by teaching. Later on, in Boston, she edited *The Dial.* In 1844 she wrote *Women in the Nineteenth Century,* and in the same year, at the invitation of Horace Greeley, she went to New York and contributed articles to *The Tribune,* which were afterwards collected as *Papers on Literature and Art.* She afterwards went to Europe, and in 1847 met at Rome the Marquis Ossoli, to whom she was soon after married. She entered with enthusiasm into the struggle for Italian independence. In 1849, during the siege of Rome, she took charge of a hospital; and, on the capture of the city by the French, she and her husband and their child, after a period of hiding, set sail for America in 1850. The vessel was driven on Fire Island, near New York, by a violent gale in the early morning of July 16; the child's body was found on the beach; but nothing was ever seen afterward of Margaret Fuller or her husband. See *Life* by T. W. Higginson.

Fulton (*ful'tŭn*), **Robert.** When Robert Fulton launched the first steamboat, the *Clermont,* on the Hudson River, in 1807, his old friends in Lancaster, Pennsylvania, probably were not surprised. They had always expected the quick-witted, ingenious Irish boy, who had grown up among them, to do something remarkable, and they were proud and glad of his success. He had been such a manly, good-tempered

handsome boy, that everyone who knew him, loved and admired him. A busy city of 50,000 people to-day, Lancaster, at the time of the Revolutionary War, was only a farming village in the rich valley of the Susquehanna. The Dutch and Quakers who dwelt there were very sober people and prone to be critical of conduct; so Robert Fulton, the lively, imaginative son of poor Irish immigrants, must have been an exemplary youth to have won their approval.

This inventor of the steamboat was born on November 14, 1765, on a farm in what now is Fulton township, but the family soon afterwards moved to town and, the father dying, was left to a rather precarious manner of living. At a very early age Robert was earning money by painting miniatures, so the prediction was freely made that he was to become as famous a painter as Benjamin West, a Quaker boy who had gone to London. Many held to the opinion that the boy was to be an inventor, for his talent for mechanics was equally well-marked in boyhood. He powdered lead and made his own pencils; he attached a paddle-wheel, worked with a crank, to his pole-boat, so as to leave himself free to fish; he pulled heavy loads up a hill by means of an inclined plane and a windlass; and he made his own rockets for celebrating the Fourth of July. He designed guns for the gunsmith and then calculated how far they would shoot. For the making of these boyish devices he had to study mathematics and physics, and he applied the same principles that he used in later inventions. Besides, he learned everything he could from practical workmen. The smith, the chemist and the miller delighted to talk to him, because he asked no idle questions, and he never broke or mislaid a tool he was permitted to use. For a long time he was making mysterious experiments with mercury, and so got the nickname of Quicksilver Bob, which so accurately described his active fingers and brain that the name stuck to him, even after he became famous.

At 17 Fulton went to Philadelphia to study art. So well did he use his time and talents that at 21 he had $400 to invest in a farm for his mother and sisters. He took the long journey across the Alleghanies and back to see them comfortably settled, before going to London to continue his studies under Benjamin West. It was this act of filial duty that turned his thoughts from art to engineering. He had seen many rich valleys that were unsettled because farm-produce could not, except at great expense, be brought out of them to market. The locomotive was not yet invented. Everyone expected that a network of canals was to solve the transportation-problem, with horses on a tow-path pulling huge flat-boats. But Fulton already had the idea of using steam instead of horse-power. On the ocean there was the further necessity of protecting the carrying trade from interference by powerful navies. So the ideas of better and cheaper canals, of swifter travel by steam and of explosives began to occupy his mind, although he continued to paint. He was slowly winning recognition as an engineer and inventor by the substitution of cast-iron for stone in aqueducts and the introduction of the inclined plane, in place of locks, in small canals. He also invented a dredging-machine, a marble-cutter and a flaxspinning frame.

A man less in earnest would have had his head turned by his popularity in London and Paris, but he used his social success to further his serious plans. He invented a torpedo to be fired from a submarine or diving boat and set off by clock-work. That France failed to see the value of the invention was one of those curious instances of shortsightedness in men and governments. Fulton's patriotism was shown by his refusal of an offer for the secret from England. Had the United States purchased the invention and set Fulton to perfecting it, the War of 1812 might have been avoided or much shortened. Disappointed in getting recognition for his torpedo, Fulton turned his attention to the steamboat. The stationary engine of James Watt was then in general use in England, in mine and mill and factory. The inventor's mind recurred to the pole-boat in which he had fished on the Susquehanna and the paddle-wheel he had devised to propel it. Why could not a paddle-wheel of any size be turned by steam-power? Theoretically it could, but there were many steps to be taken, long years of experimenting and much money required to put this simple idea into practical use. The first boat, built on the Seine at Paris, broke in two from the weight of the engine and sank. The second boat had too small an engine for the load. But Fulton learned success by failure. In 1806 he had an engine constructed in England after a special design and shipped to New York. He knew how to make the steamboat, and he wanted to launch the first one in his native country, on the Hudson.

Although an enthusiast, a dreamer, Robert Fulton was determined, untiring, shrewd, practical. He had money of his own, and he interested other men of wealth and influence who secured a monopoly of traffic by "fire-boats" on the waters of New York. When he began to build the *Clermont* on East River, it was ridiculed as Fulton's Folly. Beside the graceful sailing-vessels on the river, the paddle-wheel steamer "looked like a back-woods saw-mill mounted on a scow and set on fire," as Robert Livingston wittily described it. But the in-

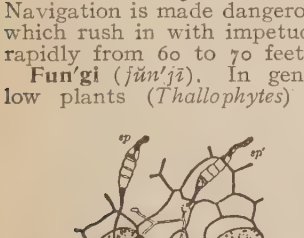
ventor persuaded a party of prominent men and women to make the trial-trip with him to Albany. His guests slept in hammocks hung on deck; Fulton, too excited to sleep, watched the machinery during the entire 30 hours. What were his thoughts as he listened to the business-like *chug-chug* of the engine, the splash of the paddles, and watched the smoke and sparks from the pine-wood fire trail back over the dark Hudson?

The inventor leaped into instant fame, steamboats could not be built fast enough to satisfy the demand, nor one be made perfect enough to satisfy its maker. He busied himself with planning the Erie Canal besides, and became an authority on explosives. When the War of 1812 broke out, he was commissioned by the government to build the first steam naval vessel. While superintending the construction of this, he contracted a severe cold and died suddenly on February 24, 1815. His death was untimely, in point of years, but few men have lived so much to the purpose, or won so much deserved love and honor as Quicksilver Bob. See *Robert Fulton and Steam-Navigation* by Thomas W. Knox. See, also, FITCH, JOHN.

Fundy, Bay of, an arm of the Atlantic, separating Nova Scotia from New Brunswick. It branches at its head into two inlets, Chignecto Bay and Minas Basin, which are separated by narrow necks of land from the Gulf of St. Lawrence. Its greatest breadth is 45 miles, and its length, up to Chignecto Bay, is 140 miles. It receives the St. John and St. Croix Rivers. Navigation is made dangerous by the tides, which rush in with impetuous force, rising rapidly from 60 to 70 feet.

Fun'gi (*fŭn'jī*). In general, fungi are low plants (*Thallophytes*) which do not contain chlorophyll, in contrast with the algæ, which do. As a consequence fungi cannot manufacture their own food out of raw materials, as do the algæ, and are dependent for it upon other plants or upon animals. In obtaining this food they have cultivated two habits. Some are parasites, that is, they prey upon living plants and animals, which are then called hosts. Some of the parasitic fungi are very injurious or even destructive to their hosts. They may grow upon the surface of the host, sending suckers into the body as in the common mildews; or they may burrow within the body of the host, as in the wheat-rust. Parasitic fungi destroy an immense number of useful plants and animals and also many other plants and animals to which we pay no attention. Other fungi are *saprophytes;* that is, they use for food decaying bodies of plants and animals or the products of living bodies. For example, the common mushrooms use decaying vegetation; the common blue-mould grows on old bread, jars of fruit etc. Saprophytes in general are beneficial, since they are great scavengers. Some fungi may be either parasites or saprophytes as occasion demands. The body of an ordinary fungus is a more or less interwoven mass of delicate threads, called the mycelium (plural mycelia), the individual threads being called hyphæ (singular hypha). It is the mycelium of the parasitic forms which spreads on the surface of the host or burrows into its tissues. The four prominent groups of fungi are the *Phycomycetes*, containing such forms as the black-moulds and downy mildews; the *Ascomycetes*, containing the mildews, blue moulds, truffles, cup-fungi and probably the yeasts; the *Æcidiomycetes*, containing the rusts and smuts; and the *Basidiomycetes*, containing the mushrooms, toadstools and puff-balls. See the names of these groups.

JOHN M. COULTER.



GERM TUBES OF FUNGI

Part of the surface of a leaf showing the cells of the epidermis (outlined by solid lines), with three stomata. *sp*, *sp'*, *sp''* are three spores of a fungus, germinating. The germ tubes from *sp* and *sp'* are entering stomata; that from *sp''* is penetrating the cell wall.

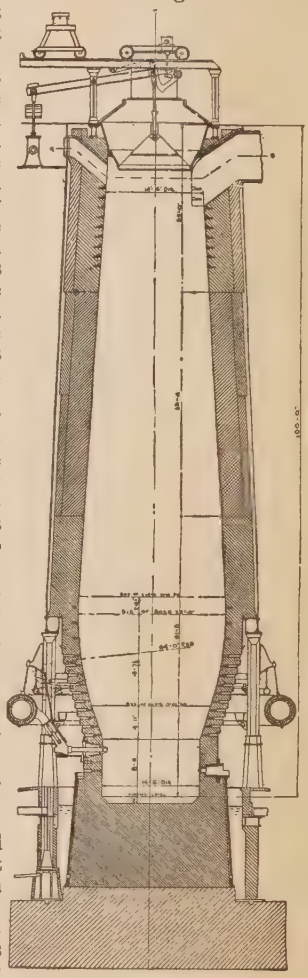
Fur is the covering of certain animals, especially those that inhabit the lands or waters of cold countries. It is distinguished from hair by its greater softness and fineness. Furs are among the first materials used for clothing and also for covering couches and the floors of tents. They early became an important article of trade in Europe, and were used a great deal by the higher classes. One French king used 746 ermines for the lining of one of his coats. In North America there always has been a large trade in furs. Forts were established to protect and control the trade, and the great Hudson Bay Company grew up, which acquired control over a vast territory but now is a trading-company. The furs collected are sold at the great half-yearly sales of the company in London. The fur-trade has played an important part in the settlement of the northwest. One of the most prominent men engaged in it was John Jacob Astor, who founded Astoria. (See ASTORIA.) The purchase of Alaska in 1867 opened to Americans a new field for the fur-trade. The furs from this territory are mostly those of the fur seal, the otter and general furs, as those of the beaver, fox, marten and bear. The yearly value of this fur-trade is over $1,200,000, and the government receives a tax of over $300,000 for the taking of seals. The most fashionable and costly fur of all

is the Russian sable, some of the finest of which sell for over $200 apiece. Among other furs now sold are those of the black bear, badger, beaver, chinchilla, ermine, fox, leopard, marten, mink, raccoon, skunk, squirrel, wolf and wolverine. The usual mode of dressing furs is by steeping them in liquor for a short time, after which the pelts are "fleshed" over a sharp knife to get rid of the excess of fat, etc. and then dried off; they are next trodden by the feet in tubs of warm sawdust and common butter, by which the pelt or leather is made supple; the skin is then finished in dry sawdust and beaten out.

Furies, The or **Erinys, Diræ** and **Eumenides,** were, in Greek mythology, female divinities who were avengers of iniquity. These goddesses were daughters of Night, or, according to another myth, of Earth and Darkness, who sprang from the blood of the mutilated Uranus. Their number varied, but they usually are spoken of as three: Megæra (the grimly jealous), Alecto (the unwearied persecutor) and Tisiphone (the avenger of murder). Nothing, it is said, escaped their sharp eyes as they pursued the evil-doer with speed and fury, permitting him no rest. They were variously represented, at one time as female figures of odious aspect, clad in black, sometimes winged, with hair formed of vipers and carrying a serpent, a knife or a torch; at another time, they were characterized as divine beings, whose functions were to punish neglect of duty and breach of faith, yet who were looked upon as preservers of a high morality and hence were called Eumenides or the well-minded goddesses. Their abode was Colonos, near Athens.

Fur'nace, in general any arrangement in which heat is produced by burning fuel. It usually is a structure of iron or brick, lined with fire-brick to withstand intense heat. Furnaces are used for domestic purposes, as heating and cooking; for motive-power, as for steam-boilers; and for metallurgical and chemical processes. For heating and power purposes, see HEATING AND VENTILATION and BOILERS.

Furnaces used in metallurgy are of two kinds: (a) those in which the burning fuel and material to be heated are mixed and (b) flame-furnaces, where the fire-grate is separate from the flame-chamber or working-chamber in which the materials to be heated are placed. The common blacksmith forge is a simple example of the first class. Blast-furnaces and cupolas also belong to this class. A blast-furnace is a vertical structure in which ores of iron are roasted and smelted in contact with suitable fuel and fluxing-materials. The burning of the fuel is accelerated by a blast injected under pressure through openings called tuyères near the bottom. The dimensions of the furnace are such as to produce a thorough mixture and heating of the materials. In all modern blast-furnaces the blast is heated to a high temperature before being forced into the furnace. Blast-furnaces are from 60 to 100 feet high and from 20 to 25 feet in diameter at the middle. The narrowest parts are at the bottom and top. The fuel and the ore with certain fluxes, usually limestone, are introduced in alternate layers at the top. The melted metal gathers at the bottom and is drawn off to be cast into "pigs" or, in many modern furnaces, to be passed directly to the Bessemer converters to be made into steel. There also is formed a slag at the bottom from the melting of the limestone and earthy matters of the ore. This slag floats on the iron and is drawn off separately. The gases are burned to heat the blast and also to run gas engines. Formerly part of the gas was burned under boilers for the generation of steam power. The output of some of the great American furnaces is very large. That of two furnaces near Cleveland, O., is 600 tons each in every 24 hours.

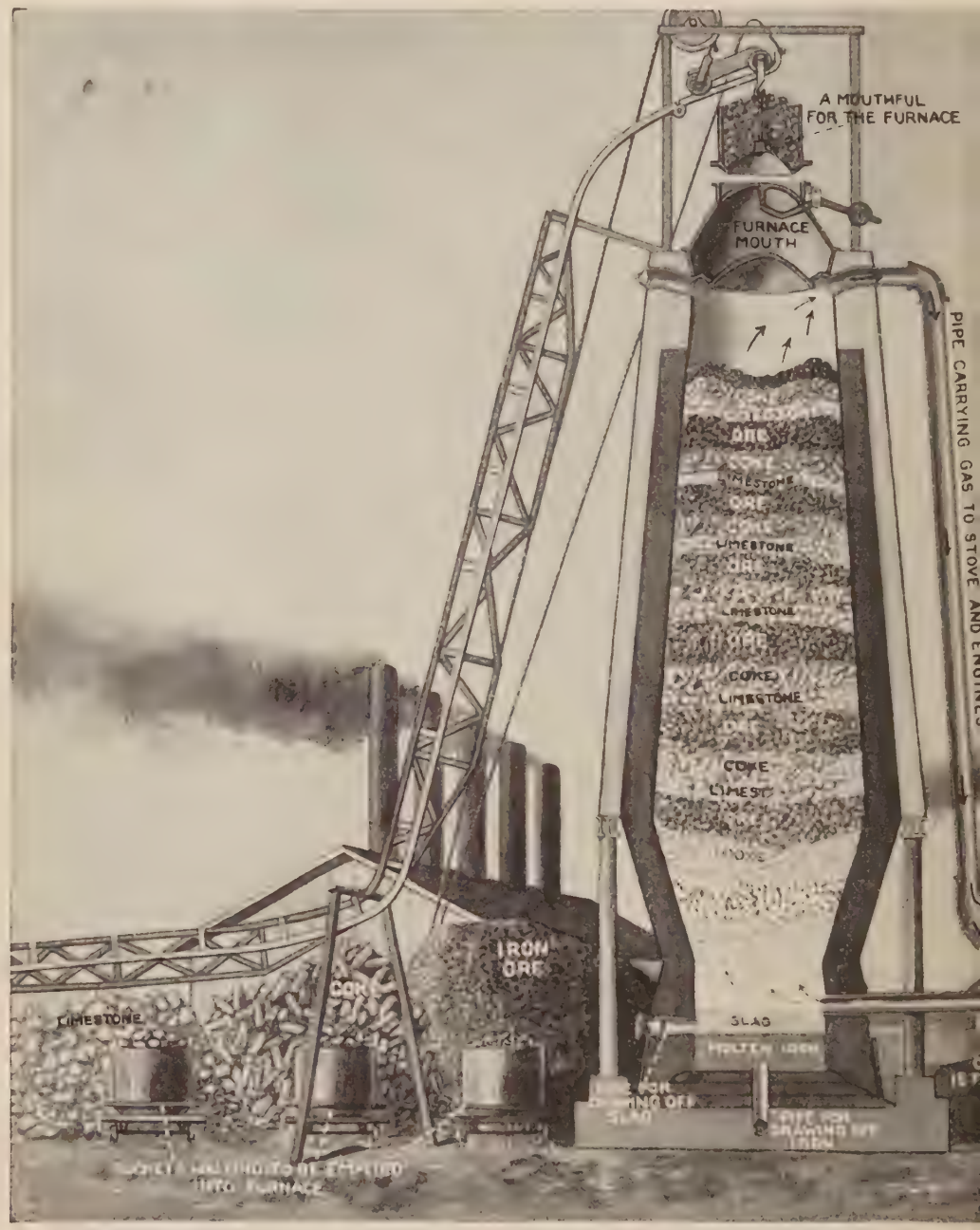


BLAST FURNACE

The reverberatory furnace is a furnace of the flame-class. The flame-chamber is arched in order that the heat may be reflected and concentrated upon the work on the hearth, and hence comes the name reverberatory. These furnaces are used in metallurgical processes, particularly in handling steel. See STEEL.

The amount of heat utilized in most furnaces is a very small part of the whole pro-

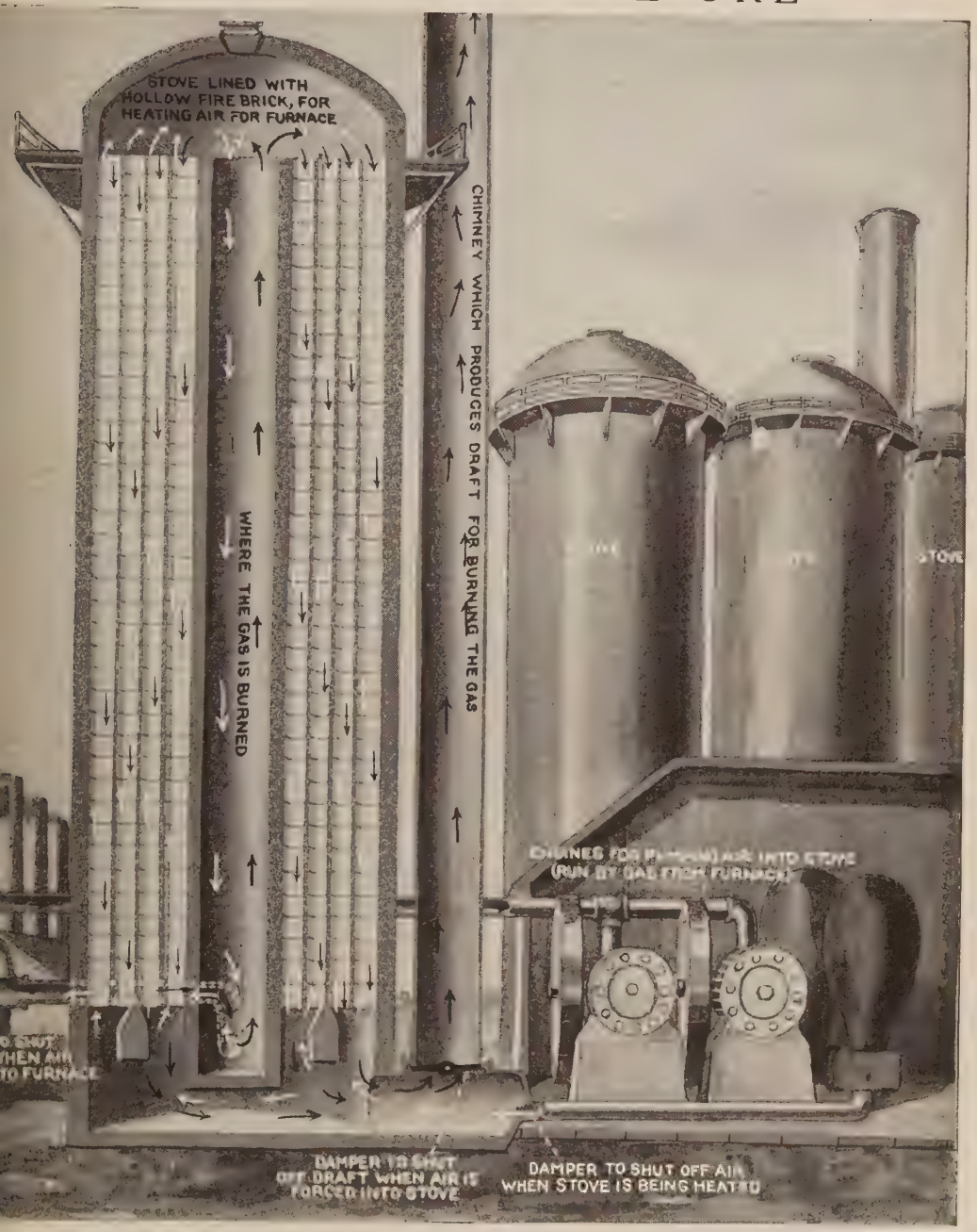
THE BIG STOVES THAT COO



The manufacture of iron and steel, the greatest of human industries, starts in the melting of the iron out of the ore in the big "cannon stove," called the blast furnace. The ore is put into the furnace in layers alternating with coke and limestone. The coke starts the melting of the iron, while the limestone unites with impurities in the ore, and these impurities being lig than iron, rise to the top, like cream on milk, and drawn off as slag.

Now this fire in the blast furnace creates a g

THE IRON OUT OF THE ORE



of gas which is piped from the top of the furnace another big stove and into a gas engine. The gas h is burned in the stove heats the air in those nels in the fire brick as it passes through, and the engine pumps this heated air back into the blast furnace so that the ore melts much faster than if the fires were kept up by cold air. The black arrows show the course of the gas, the white arrows the course of the air. Each blast furnace requires several stoves, you see.

duced by the burning of the fuel; the greater part is lost in the escaping gases and in connection with radiation. In most furnaces not over two or three per cent. is utilized. In flame-furnaces this rises to 15 or 20 per cent., and in some blast-furnaces it may rise to 80 per cent.

Furniture-Manufacture. This industry at the present day flourishes more in America than elsewhere. There is, however, no special form or style of furniture recognised as more correct than another. Steam was first applied to the making of furniture in 1815. Several historic styles are still followed in furnituremaking, including the light Chippendale, the heavy mahogany, the elaborate rococo, the severe Gothic and the Spanish-mission style. By 1850 most ordinary furniture was machine-made, for scrolls and ornaments could be readily and cheaply wrought into it by the machines. The best cabinets, however, continued to be made by hand. The great centers of the furniture-industry in the United States are New York, Chicago and Grand Rapids, Mich.; but six other cities in the United States produce furniture to the value of over $2,000,000 yearly. In respect of design America is responsible for many useful contrivances in the manufacture of furniture, including principally folding-beds and rocking-chairs. But lovers of artistic furniture complain that the use of machinery has led to the sacrifice of good taste to economy of production. The recent extension of the teaching of woodwork in American schools is likely to elevate the standard of taste and workmanship in the furniture-manufacture.

Furs. The history of the development of Canada, of the earlier struggles between the French and English for possession, of the opening of the northwest, which is still going on, and of exploration is largely the history of the fur-trade. Though the pursuit of fur-bearing animals has long ceased to be one of the principal industries of Canada, it in 1906 exported no less than $2,464,337 in furs alone. See HUDSON BAY COMPANY.

Fusiyama or Fujiyama (*fōō'jē-yā'mȧ*), a sacred volcano, the loftiest mountain of Japan, stands on the main island, about 60 miles southwest of Tokio. It rises some 12,200 feet above the sea, with a crater 500 feet deep. Its last eruption was in 1707. The cone is free from snow only from July to September, when thousands of white-robed Buddhist pilgrims make the ascent easily enough. A traveler visiting Japan was asked: "Have you seen it?" "What?" he said. "Oh, it; when you see it, you will know it." And one day when the clouds that had been covering the sky broke away, he saw high up in the heavens the snow-capped peak of Fujiyama, looking like a fairy castle floating on a bank of clouds, and exclaimed, with as much enthusiasm as the Japanese themselves: "Oh! I've seen it! I've seen it!"

Fuze, a means of igniting an explosive at the required instant, whether it is used in blasting, military operations and mines or as the bursting charge of a shell or bomb. It is of two kinds. One is the instantaneous, the other the ordinary fuze, the first burning at 30 feet a second, the other at three feet a minute. The ordinary fuze consists of a train of gunpowder in layers of tape covered with gutta-percha; in the instantaneous fuze, which is distinguished by crossed threads of orange worsted outside, quick match takes the place of gunpowder. Powder-hose is sometimes used when no other fuze is available. It is made of strips of linen, forming, when filled with powder, what is called a sausage, one half to one inch in diameter.

The fuzes used for shells are of a totally different character and of many patterns. They are of two classes: those which depend for their action upon the rate of burning of the composition in them, called time-fuzes; and those which burst the shell on its striking the target, ground or water, and called percussion-fuzes. Time-fuzes are hollow, truncated cones of beechwood, carrying a column of fuze-composition, which burns at a fixed rate. Marks and figures on the outside show twentieths of a second or less, and indicate where the hole must be made by a fuze-borer in order that the flame may have access through it to the shell at the desired instant during its flight. Time-fuzes are chiefly used with shrapnel shell and mortars. Their length varies from three to six inches, and they are fixed into the head of the shell before firing. The thickness of iron would prevent the passage of the flame through the hole made by the borer in the shorter fuzes, and, therefore, two or more powder-channels are made in them, parallel to the fuze-composition, to communicate its flame to the bursting charge. In guns having windage, that is, in which the ball is smaller than the bore of the gun, the fuze is ignited by the flame of the cartridge enveloping the shell, and quick match is placed on the top of the fuze to facilitate this. A metal-cover protects the quick match until the last moment and is then torn off by means of a tape provided for that purpose. In guns having no windage a percussion arrangement is placed in the head of the fuze, so that the shock of the discharge may ignite the fuze composition. Fig. 1 shows a section of the

FIG. 1

common time-fuze, through one powder-channel. A section of the percussion-fuze is shown in Fig. 2. It is a hollow, gun-metal cylinder (*a*) so arranged as to screw into the head of the shell. Inside is a movable pellet or ring (*b*) of white metal, driven with fuze-composition like a tube and carrying a percussion-cap. It has four feathers or shoulders projecting from its sides, and above these a gun-metal guard (*c*) fits round the pellet loosely, so as to prevent the cap of the pellet from coming in contact with a steel pin which projects downward from the top of the fuze. A safety pin (*d*) goes through the fuze with the same object, but is removed before firing, and a lead pellet (*e*) then closes the aperture left by its removal On discharge, the shock of impact on the target or ground causes the pellet to set forward, bringing the cap against the pin, igniting the fuze composition and bursting the shell. Percussion fuzes are used chiefly with "common" shell. Very many others are in use, chiefly modifications of these two types: *e. g.*, the delay-action fuze has both a percussion and time arrangement, so as to burst the shell an instant after impact. All are delicate and apt to become hopelessly impaired with age or exposure to damp. In the American pneumatic dynamite-gun, the shell contains an electric battery, and the circuit is completed by the shell striking either water or the target.

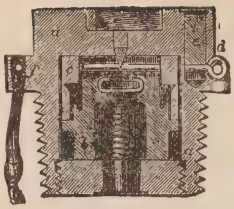


FIG. 2

G

G (*jē*), the seventh letter, is a vocal consonant. It represents two sounds: one simple, as in *gave*, the other compound, like that of *j*, as in *gin* The first is a guttural, its place being the soft palate and the back of the tongue. The simple sound is called hard *g*, the compound one soft *g*. Hard *g* occurs before *a*, *l*, *o*, *r*, *s* or *u* in the same syllable; at the end of a word; sometimes even before *e*, *i* or *y*. Examples: *gay*, *glad*, *go*, *grow*, *bags* and *gun*; *berg*; and *get*, *gig* and *muggy*. Soft *g* usually occurs before *e*, *i* or *y* and in *gaol*. Examples: *gem*, *engine* and *stingy*. *G* is silent before final *m* or *n*, as in *phlegm* and *sign*. So is initial *g* before *n*, as in *gnostic*. In some words, from the French, *g* equals *z*, as *rouge*. *G's* name and shape, a modified *C*, come from Latin, probably through French.

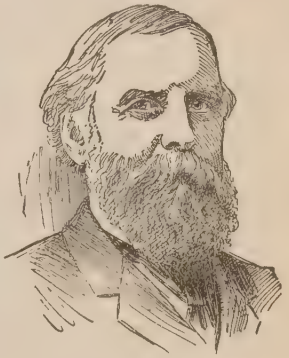
Gabun. See FRENCH CONGO.

Gadsden Purchase, a name given to that part of New Mexico and Arizona which was purchased from Mexico by Gen. James Gadsden for the United States on Dec. 30, 1853. The sum of $10,000,000 was paid for the territory, which included an area of 45,535 square miles.

Gadski (*găd'z'kē*), **Johanna,** German opera singer, born at Anclam, Prussia, 1871. After receiving a musical education at Stettin, she made her début in New York, taking the rôle of Brünhilde in Wagner's opera. She is popular as a singer in England, having sung at Worcester Festival and at Covent Garden. She was enthusiastically received in America during her concert tour in 1899–00 and her reputation has increased in later years. She is particularly successful in her rendering of Wagner.

JOHANNA GADSKI

Gage, Lyman Judson, American financier and secretary of the treasury in the McKinley administration, was born at De Ruyter, Madison County, N. Y., on June 28, 1836, and was educated at the academy, Rome, N. Y. For a time he had a junior post in an Oneida bank; but in 1855 he went to Chicago, where he became cashier in the Merchants' Loan and Trust Company, and in 1868, entering the service of the First National Bank, he rose to be president of the institution. During the Columbian Exposition he acted as president of the board of directors, and has since been president of the Chicago Bankers' Club, the American Bankers' Association and of the Civic Federation of Chicago. In March, 1897, he became secretary of the United States treasury, but resigned in 1902. He resides in New York.



LYMAN J. GAGE

Gaines Mill, Battle of, one of the famous seven days' battles of McClellan's Peninsular campaign. McClellan had crossed the Chickahominy with a part of his army, leaving Gen. Fitz-John Porter with 35,000 men on the north bank. Here Porter was attacked on June 27, 1862, by the Confederate army, 55,000 strong, under Generals Lee and Stonewall Jackson. After hard fighting all day, the Federals were driven back, and the advantage rested with the Confederates, though the result was not decisive. Porter's loss was nearly 7,000 in killed, wounded and prisoners. The locality is about eight miles northeast of Richmond, Va.

Gainesville, Texas, city and county-seat of Cooke County, sixty-five miles north of Fort Worth. It is important as the center of a stock-raising and agricultural region. Its industries include pressed-brick works, carriage and leather-factories, cotton seed-oil and flour-mills, soap-factories and meat-packing establishments. The city has good schools, several churches and the service of two railroads. Population 7,624.

Gainsborough, Thomas, a noted English landscape-painter, was born in Suffolk, in 1727. When fourteen, he was sent to London to study art. He first established himself in Ipswich, later at Bath and finally at London. He was one of the foundation-

members of the Royal Academy in 1768. He died on Aug. 2, 1788. As a portrait-painter he was the only worthy rival of the great Reynolds. In landscape-painting he reached a high rank. See Brock-Arnold's *Gainsborough and Constable.*

Galahad, Sir, in the Arthurian romances, the noblest and purest knight of the Round Table. He was the son of Sir Launcelot of King Arthur's court by marriage with Elaine, the fair daughter of King Pelles, and achieved the honor of winning the Holy Grail, in the quest of which his father and the other knights had failed. The meaning is that Sir Galahad, according to the legend, had been permitted by his sanctity to see the Holy Grail (Sangraal); that is, that he saw not by the eye of faith merely but with his bodily eyes, and touched with his hands the incarnate Savior, reproduced by the consecration of the elements of bread and wine. He therefore takes the "seat perilous" at the banquet of King Arthur and his knights, and becomes king of the Holy City. See Malory's romance of *Morte d' Arthur* and Tennyson's lyric of *Sir Galahad,* his *Elaine* and the *Holy Grail* in the *Idylls of the King.*

Galen (*gā'len*), **Claudius,** a celebrated Greek physician, was born at Pergamus, Mysia, in 130 A. D. He studied medicine at various places, and was physician to the school of gladiators in his native city for six years. He then went to Rome, where he gained a great reputation, attended the emperor Marcus Aurelieus and his two sons and, later, the emperor Severus. Of his works, eighty-three genuine treatises still exist. He gathered all the medical knowledge of his time, and fixed it on such a firm basis of truth that his work continued to be the authority in that science for centuries. He died, probably in Sicily, about 201 A. D.

Galena, Ill., is the county-seat of Jo Daviess County. It was named from the galena, the most important of the lead-ores, found in its vicinity; settled in 1827; and incorporated as a city in 1839. About 1850 it became the western terminal of the first-built section of the present Chicago and Northwestern Railroad. It is also served by the Chicago, Burlington and Quincy Railway. The city, which owns its electric-light plant, has a large trade and is a center of great interests in lead and zinc. Among the other industries are shoemaking and smelting. Galena is famous for having been the home from which Grant entered service in the Civil War. The homestead still is one of Galena's attractions. Others comprise Grant Park, the statue of Grant, the federal custom-house, the government-building and the public library. Population 4,875.

Gale'na, Kan., a thriving city of Cherokee County, southeastern Kansas, on the Kansas City, Fort Scott and Memphis Railroad. It is also reached by the St. Louis and San Francisco Railroad, and is seven miles west of Joplin, Mo. Mining is the chief industry of the region, which is rich in deposits of lead and zinc. The city added some eight thousand to its population in the previous decade, the number of its inhabitants now being 6,096, employment being given to many of them in the town's stamping and smelting works and other industrial activities.

Galesburg, Ill., the capital of Knox County, on four branches of the Chicago, Burlington and Quincy Railroad, also has the service of the Santa Fe, and is 162 miles southwest of Chicago. It is in a rich agricultural region, and near by are also some remunerative coal-mines. It possesses some notable educational institutions, among them Knox College (Congregational, Lombard University (Universalist), etc. It has considerable industries, including machine-shops, foundries, carriage and wagon-works, stockyards and the largest paving-brick manufacturing plant in the world. Population, 24,500.

Gal'ilee, one of the four Roman divisions of Palestine. In the time of Christ it included the whole northern portion of Palestine from the Mediterranean to the Jordan. The district was divided into Upper and Lower Galilee, the former being hilly and wooded and the latter level and fertile. At that time it was mainly inhabited by Syrians, Phœnicians, Arabs and Greeks, with a few Jews. It had, therefore, long been known as Galilee of the Gentiles, *i. e.*, of the nations. The principal towns were Tiberias and Sepphoris. Those that figure in the gospels are Cana, Capernaum, Nazareth and Nain. There are still in this region the ruins of many fine synagogues. Galilee now forms part of the division called the pashalic of Damascus, in the Turkish province of Syria. It still has a number of Jewish inhabitants. See Dr. S. Merrill's *Galilee in the Time of Christ.*

Galilee, Sea of, called also Lake of Gennesaret, Sea of Tiberias and Sea of Chinnereth. It is a lake in the northern part of Palestine, lying 626 feet below the sea, and is thirteen miles long by six broad and 820 feet deep. It occupies the bottom of a great basin, and is of volcanic origin. Its waters are cool, clear and sweet, although the red and turbid Jordan and many warm springs find their way into it. Its shores on the east and north are bare and rocky; on the west they slope gradually and are covered with vegetation. It has many sacred associations. On its banks are Bethsaida, Capernaum, Magdala and Tiberias. In the time of Christ the surrounding region was the most densely populated in Galilee; now even its fisheries are almost entirely neglected.

SIR GALAHAD—*George F. Watts*

His strength was as the strength of ten,
Because his heart was pure.

The Poetry of Art

Myth Allegory Legend

© *Horace K. Turner Co.* *Boston Museum*

Automedon, with Horses of Achilles, by A. G. Regnault (French b. 1843)

Aurora, by Guido Reni (Italian b. 1575) Palazzo Rospigliosi, Rome

Love Grown Cold, by Jean Aubert (French b. 1824)

A Reading from Homer, by Alma-Tadema (English b. 1836) ©H. K. Turner Co.

Galile'o (*găl'ĭ-lē'ō*) (usual designation of Galileo Galilei), the founder of modern physics, was born at Pisa, Feb. 18, 1564, and died at Arcetri, near Florence, Jan. 8, 1642. In 1581, at the age of seventeen, he entered the University of Pisa where a brilliant career awaited him, not only in mathematics and mechanics but in literature, eloquence, music and art. From 1592 to 1610 he held a chair of mathematics in the University of Padua. The remainder of his life was mostly spent at Florence. It is easy to recall Galileo's position in time, if we remember that he was born on the day of Michelangelo's death and that he died in the year of Newton's birth.

In popular estimation Galileo has ranked as a great astronomical discoverer, and rightly so; but it is now clear that his chief service to science is the establishment of modern dynamics.

To him we owe a clear statement of the fundamental assumption of physical science, namely, that nature always behaves in the same way in the same circumstances.

To him we owe also the ideas which underlie the first two of Newton's laws of motion. See DYNAMICS.

He first enunciated the correct laws of falling bodies, showing that, if we neglect the resistance of the air, the path of a projectile must be an ellipse. In astronomy he did not invent the telescope, as is so often asserted; but he used this instrument with great skill to discover spots on the sun, measure its rotation-period, discover four of the satellites of Jupiter, observe the phases of Mercury and Venus and find the elongated form of Saturn which Huygens later showed to be due to the planet's rings.

But no astronomical service of Galileo can outrank that which he did in establishing the Copernican system by showing the mechanical principles upon which the solar system is constructed. In 1616 he was warned by the Inquisition not to "hold, teach or defend" the Copernican system, and agreed to act upon their advice. Nevertheless, in 1632, he published his *Dialogue Concerning the Two Great Systems of the Universe*, which proved to be a somewhat disguised yet powerful argument for the Copernican view. As a result he was summoned to Rome in Oct., 1632, where he disavowed his adherence to the heliocentric system. The story which is often told of his recanting and then remarking concerning the earth, as he rose from his knees: "It does move, however!" is a pure fiction of later times.

An English translation of the more important of Galileo's writings is sadly needed.

Gallatin (*găl'là-tĭn*), **Albert,** an American statesman, was born at Geneva, Switzerland, Jan. 29, 1761 He studied in its university, and in 1780 emigrated to America. He served a short time in the Continental army, and taught French for a year at Harvard College. He settled in Pennsylvania, and was naturalized in 1786. He soon entered politics. When the "whiskey insurrection" broke out, Gallatin, at considerable personal risk, helped to bring it to a peaceful close. From 1795 to 1801 he was a member of the house of representatives, and was a recognized leader in his party. He directed his attention especially to financial questions, and under Jefferson and Madison was secretary of the treasury, where his successful management and his writings made him recognized as one of the first financiers of the age. He also took an important part in the negotiations for peace with England in 1814, and signed the treaty of Ghent. He served as minister to France and to England together with other important posts. The latter part of his life was devoted to literature. He made a study of the American Indians, and wrote several works on the subject. He died at Astoria, N. Y., Aug. 12, 1849. See *Life* by Henry Adams.

Galley, a long, narrow rowboat, carrying a sail or two, but depending for safety and movement upon oars. When small, galleys were called galleots and brigantines. An old-time galley was about 150 feet long, and its greatest beam was 20 feet wide. It carried two masts, a mainmast and a foremast, each with a great lateen-sail. There were a short deck at the prow and one at the stern. Between the two were sometimes 54 banks or benches, 27 on a side, occupied on either side by four or five slaves, whose duty was to propel the vessel by means of oars. If a Christian vessel, the rowers were either Turkish or Moorish captives or Christian convicts; if a Barbary corsair, the rowers were Christian prisoners. Sometimes a galley-slave worked as long as twenty years, sometimes all his life, at this onerous calling. Slaves were chained so close together on their narrow bench that they could not sleep at full length. Biscuit was made to last six or eight months, each slave getting 28 ounces three times a week and a spoonful of some mess of bones, rice or green stuff. Between the two lines of rowers ran the bridge, and on it stood two boatswains, armed with long whips with which they scourged the slaves. On a large galley, besides 270 rowers, there was a mixed crew of about 75 men, together with 50 or 60 soldiers; so that the whole equipment of a fighting-galley must have reached about 400 men. A galleas originally was a large, heavy galley, but later it became a sailing ship, as was the galleon of the Spaniards. See S. Lane-Poole's *The Barbary Corsairs.*

Galls, deformities produced on plants by insects, fungi and slime-moulds. One species

of insect attacks the root, another leaf, flower or stem. Of insects that cause galls may be mentioned gall-flies, certain caterpillars, a few beetles, certain mites and scale-insects. Eggs are laid in the tissues of the growing plant, and generally the galls appear to form after the egg hatches.

Galsworthy, John, one of the foremost English dramatists and novelists of the 20th century, born in 1867. Among his many novels are *Villa Rubein* and *A Man of Devon*, two early works which received little attention; *The Island Pharisees*, a study of English life; *A Man of Property* and *Fraternity*, both concerned with economic and social questions. Among his plays are *Joy*, *Strife*, *The Silver Box*, and *Justice*. Though protesting against injustice, Galsworthy does not sacrifice artistic workmanship to propaganda.

Galt, Sir Alexander T., was born at Chelsea, England in 1817, educated in England, came to Canada and settled in Montreal. A government director of the Grand Trunk Railway in 1857–8, he proposed resolutions in the Canadian Parliament in favor of a federal union of British North America colonies in 1858. These resolutions became the basis of the policy of the government which he joined that year under Sir George E. Cartier. With Sir George E. Cartier and the Hon. John Ross he went as a delegate to England to urge the imperial government to sanction federation and the construction of the Intercolonial Railway; was minister of finance from 1858 to 1862, and a second time from 1864 to 1866. He was a delegate to Washington respecting the renewal of the reciprocity treaty, 1866–7, and was a member of the fisheries commission appointed under the treaty of Washington which sat at Halifax in 1877. He conducted negotiations on behalf of Canada for a commercial treaty with France and Spain, 1879, and was High Commissioner for Canada in England, 1880 to 1883. Until his death in 1893 he then lived in retirement.

Gal'ton, Francis, an eminent English scientist, was born near Birmingham in 1822. He graduated from Trinity College, Cambridge, in 1844. He travelled in 1846–1847 in the Sudan, and in 1850 entered upon a thorough exploration of part of the southwest of Africa. On his return to England Galton published the narrative of his explorations. He next turned his attention to meteorology; and to him are due both the theory of cyclones and anticyclones and the device of weather-maps. Galton is greatest as a student of human heredity. In his *English Men of Science*, *Hereditary Genius*, *Inquiries into Human Faculties*, *History of Twins* etc. he made studies, some of them quantitative, which led him to set the greatest emphasis upon heredity and to attribute less importance to ordinary differences in nurture than was previously done. He also published two papers on finger-prints. Galton has made the methods of statistics popular among modern scientific students. He died in 1911.

Galuppi (*gà-lòòp'pē*), **Baldassare** (1706–1784). Italian composer of operas and harpsichord-music; chapel-master at St. Mark's, Venice, and director of the Incurabili, one of the four renowned conservatories of Venice. Robert Browning has introduced him in his poem, *A Toccata of Galuppi's*.

Galvani (*gàl-vä'nē*), **Luigi,** an Italian surgeon, distinguished especially for his electrical discoveries He was born at Bologna on Sept. 9, 1737, and died on Dec. 4, 1798. From 1775 he was professor of anatomy in Bologna In 1780 he observed that frogs' legs, when skinned and supported on hooks of two different metals in contact, begin to twitch. He recognized in this the electrical effect of a battery composed of two metals and the moist frogs' legs. In 1786 he studied the effect of atmospheric electricity in stimulating the nerves of the frog's leg. The frog's leg, thus used, is indeed the earliest galvanometer of which we have any account.

Gal'vanom'eter, an electrical instrument employed to detect the presence of an electrical current and sometimes to measure the intensity of the current. More than nine tenths of all the galvanometers in use depend upon the fact that a conductor conveying an electric current is surrounded by a magnetic field. (See ELECTRICITY.) Up to the last quarter of the 19th century currents were very frequently measured by their electrolytic effects and sometimes by their heating effects. Edison has devised a commercial current-meter which measures the current by measuring the amount of zinc which the current will remove from one zinc-electrode and deposit on another. Major Garden has invented a galvanometer for measuring electromotive forces, which depends upon the fact that the larger the current the hotter and longer the conductor. But these two instruments are not widely used. Galvanometers of the magnetic type are of two different kinds. In one the conductor is bent into a circular coil of wire, in the middle of which is suspended a small magnet. The magnet, when not acted upon by any moment of force, will set itself in the plane of the earth's magnetic meridian or in the direction of any artificial field which may be placed about it. If a current be passed through the coil of wire which has been placed in the plane of the magnetic field, the magnetic field will be changed and the suspended magnet will turn on its axis, thus indicating the presence of the current. This form of instrument has been brought to great perfection through the efforts of Lord Kelvin and, later, of

Dr. F. Paschen of Germany. The other kind of galvanometer, which depends also upon the magnetic effect of the current, is one in which the magnet is fixed and the conductor so suspended as to rotate between the poles of the magnet. The position of equilibrium of the coil is such as to include no lines of force. When a current passes, the coil sets itself so as to include the greatest possible number of lines of magnetic force and thus indicates the presence of the current. This type of instrument was perfected by Kelvin and by D'Arsonval. It is generally known as the D'Arsonval galvanometer.

Very perfect galvanometers of this type, so graded as to read the current directly in ampères, are made by Weston of Newark, N. J.

Sometimes a combination of these two kinds is employed. Instead of a suspended magnet a suspended coil is employed, while the magnetic field in which this coil swings is produced by the current which is to be measured. In other words, a movable coil is suspended in the field of a fixed coil. This tpye of instrument was invented by Weber, and used to be called an electro-dynamo meter, but has been brought to a high degree of perfection by Kelvin in his ampère-balance.

A galvanometer, which has in it a resistance which is high compared with other parts of the circuit is called a voltmeter, because its readings are proportional to the voltage between the terminals of the circuit to which it is applied.

Gal'veston, in southeastern Texas, has an interest and importance exceeding that of any other city of the same size in the United States. Its special claim to distinction lies in the energy of its citizens in wresting prosperity out of unparalleled disaster and, at the same time, initiating the business-corporation form of municipal government known widely as the Galveston plan. The situation of the city on Galveston Bay, which is 35 by 15 miles, gives it the best natural harbor on the Gulf of Mexico and makes of it a seaport second only to New Orleans. Its further growth must keep pace with the development of the great southwest. It had the disadvantage of lying on an island which, although 30 miles long by three wide, rose but a few feet above the level of the Gulf and was occasionally flooded. Proper paving and drainage were impossible. Lying in the same latitude as St. Augustine, Florida, its climate is subtropical. Groves of oleander and orange gave it beauty; but cholera and yellow fever were accepted as inevitable, as was corruption in the municipal government. It was a wide-open, slatternly, unhealthy town, but no one thought of changing anything, for business flourished with the enormous shipments of cotton, wheat, lumber, tallow and hides, and life, if precarious, was easy and luxurious.

On the 8th of September, 1900, the city was almost destroyed by a cyclone and tidal wave. One sixth of the population was drowned and one third of the property destroyed. The rotten cedar-block pavements floated off in rafts, laying bare the original sand. The treasury was empty, credit was gone, taxes could not be assessed on property that had ceased to exist. Thousands were fleeing the stricken city and, in the hour of extremity, the municipal government broke down. But that ill-wind had blown away indifference, greed and moral miasma. Out of the disaster sprang such energy, ability and civic patriotism as the world has rarely witnessed. The work to be done needed new, clean tools. The city was looked upon as a ruined business, and a business-corporation government was devised to build it up again.

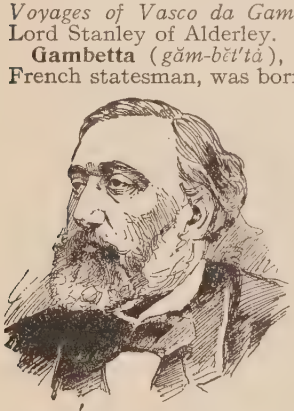
A special act of the legislature abolished the mayor and council and created a board of directors or commissioners of five members, one of whom is president, all being elected by popular vote. Salaries were nominal, for the commissioners were simply the responsible heads of departments with well-paid, expert managers under them to carry out the details. The same kind of men of independent means, position and reputation were secured as now serve for nothing on library, park and school boards in other cities. One commissioner was at the head of finance and revenue—a banker with an expert accountant, employed as city auditor, under him; one had charge of water-works and sewage, with a civil engineer; one of fire and police; and one of streets and public property.

A new city occupies the old site. Galveston has built a sea-wall four and a half miles long and seventeen feet high, and raised the grade of the city to its top. It has paved the business-section with brick and installed a sewerage system; drained the swamps; stamped out epidemics; and cleaned the town morally. In spite of this monumental work municipal expenses have been cut one third. The credit of the city is above par. The population, now over 41,000, has been more than restored, and the business has increased. The commission system has proved such an important contribution to the science of government that it has been adopted by many other cities.

Gama (*gä'mä*), **Vasco da**, the greatest of Portuguese navigators, was born about 1469 at Sines, a small seaport in the province of Alemtejo. He early distinguished himself as a brave mariner. When the voyage of Diaz around the Cape of Good

Hope caused the Portuguese to determine on further explorations, Gama was chosen to command an expedition of four vessels, manned with 160 men. Furnished with letters to all the potentates he was likely to meet, among them the fabled Prester John, then supposed to be reigning in splendor somewhere in the east of Africa, he set sail on July 8, 1497, from Lisbon. Vexed by storms, he was four months in reaching St. Helena Bay, and after rounding the Cape, in the midst of storms without and mutinies among his crew, he made Melinda early in the following year. Here, finding a skillful Indian pilot, he steered eastward across the Indian Ocean and arrived at Calicut, India on May 20, 1498. The ruler of Calicut, at first suspicious, soon became hostile, and Gama had to fight his way out of the harbor. He reached Lisbon in September, 1499, was received with great distinction, and created a noble. Three years later Gama was sent to avenge the massacre of a Portuguese colony at Calicut. He bombarded Calicut, destroyed a fleet of 29 ships, extorted a favorable peace, and founded the colonies of Mozambique and Sofala; but the cruelties inflicted in this expedition left an indelible stain upon his name. After 20 years of retirement at Evora, Gama was again sent to the scene of his triumphs, as viceroy of the Portuguese dominions in India; and, while engaged there in successful work, he died at Cochin in December, 1524. His body was taken to Portugal and buried with great pomp. The great achievement of Gama is probably only second in importance to the voyage of Columbus a few years before. His story gave rise to the *Lusiad* of Camoens. See *The Three Voyages of Vasco da Gama*, translated by Lord Stanley of Alderley.

Gambetta (*găm-bĕt'tȧ*), **Leon Michel,** a French statesman, was born at Cahors, Oct. 30, 1838. He became a lawyer at Paris, and soon attracted attention. Upon the surrender of Napoleon III at Sedan in 1870, Gambetta proposed to dissolve the empire, and he was one of the first to proclaim the republic on Sept. 4. When the government of national defense was formed, he became minister of the interior, and at once took active measures for opposing the Germans and defending Paris. He escaped from the city in a balloon, and took the general conduct of public affairs, being for five months dictator of France. With marvelous energy and undaunted courage, he called into existence army after army and sent them against the German hosts; but in vain. He continued the contest even after Paris had surrendered, and refused to agree with the action of his colleagues in the capital. He finally resigned, and retired for a short time to Spain, but be became more popular than ever with the masses, and was elected to the national assembly by the different departments. After the fall of the short-lived commune Gambetta became the most prominent Frenchman of his time, and played an important part in firmly establishing the republic. Though the most powerful statesman in France, he refused for some time to take office, but later he became president of the chamber and, in November, 1880, premier. He resigned in 1882 after the rejection of his plan for the revision of the constitution, and afterward took little part in public affairs. On Nov. 26 of that year, as he was handling a revolver, it accidentally went off, inflicting a slight wound in the hand, from which, however, he died on Dec. 31, being only 44 years old.


LÉON GAMBETTA

Gam'bia, a river of western Africa, the more southerly of the two great streams of Senegambia. It enters the Atlantic after a course estimated at over 1,400 miles, by an estuary which in some parts measures nearly 27 miles, but contracts at the mouth to little more than two miles. From June to November it is navigable for vessels for about 400 miles. The lower part of the river overflows its banks in the rainy season, and like the Nile leaves a fertile coating of mud.

Gambia, a British colony and protectorate in West Africa on the river of the same name, is situated between Senegal and French Guinea. Area, independent of the adjacent protected territories, 4 square miles; population 13,456. The colony and protectorate have an area of 3,061 square miles and a population of 163,718. The whole colony, with the exception of the island of St. Mary (area 4 square miles, population 8,807), is conducted on the protectorate system. Bathurst is the capital of the island of St. Mary; population 6,000. There are no local telegraphs or railways, but there is a short telephone line at Bathurst, a tramway is in contemplation, and there are cable lines from Bathurst to St. Vincent and Sierra Leone. There are six elementary schools (with over 1,000 pupils), government-aided, besides the Wesleyans' technical school and secondary school. The chief exports are groundnuts, beeswax, hides, rice, millet, sweet potatoes, cotton and rubber.

Games. Modern psychologists have come to regard play as one of the most important activities. The Puritanic notion that the play-spirit is something to be crushed out and even the ordinary view that games may be tolerated only when not positively injurious to body or morals and when kept within proper limits of time and expense have given place to the belief that here we find an indispensable human occupation. Play is by many regarded as synonymous with rest or recreation, and as quite as important as sleep to relieve the fatigue caused by close application to one task. This view doubtless is correct, and it constitutes an important guide to practice.

A second theory is that advanced by the poet, Schiller, and the philosopher, Herbert Spencer. According to them, play is an activity by which the surplus energy of the body is dissipated. We play because we have energy that must be used, and if work does not consume it, play is inevitable. This theory also is part of the truth about play. It does not, however, account for the fact that children play when they are tired or sick.

A third theory, that of the German philosopher, Professor Gross, seems the most complete and significant of all. According to it, play is simply the manifestation of instinctive activities on occasions when something stimulates them, although, owing to the immaturity of the players or the character of the situations, no serious immediate result is possible or desirable. This theory accounts for the form of animal play, for it is that of the instincts of the species. The puppy plays at fighting, at pursuing its prey or fleeing from its enemies. The kid leaps as if on a mountain-side, and the colt flees as from a pursuer and kicks. The practice that the animal gets through these activities matures and perfects its instincts. Play, therefore, is its method of development, its education.

With human beings it is not quite so evident that play is the manifestation of instincts. For the instincts of the child, although very numerous, also are very imperfect, *i. e.*, they require much training and experience in order to be developed to efficiency. Hence, before they are cultivated, they apparently are so useless that one would hardly recognize them as instincts at all. The hereditary element in the child's activity is very early modified by imitation and other forms of external control. Nevertheless, it is of the utmost importance, for without the instinctive tendencies there could be no development. They, in fact, constitute the powers or capacities of the child, and they reveal those interests (*q.v.*) in the direction of which all learning must proceed. During the first four or five years of a child's life the larger part of its learning comes through its play. Very early this takes the form of games largely adopted from other children, but each excellent, in that it affords a fine opportunity for the utilization and control of the instincts: fear, anger, sociability, shyness, affection, jealousy and envy, rivalry, sympathy, constructiveness, secretiveness, acquisitiveness, fondness for organization and government, for rhythm and beauty and for expression.

The play of children begins with mere impulsive activity; wiggling, grasping and handling things, throwing them about, climbing, running etc. Through this the child gains control of its body and becomes familiar with the simpler properties of common things. This knowledge and power are enlarged by the destructive and constructive sport that begins to interest children after the first year. Later, control is perfected under the influence of rivalry, when the play activity takes the form of the performance of physical or, perhaps, mental feats. In all these sports, with the possible exception of the last, the child does not need the active co-operation of others. The games in which such co-operation is necessary are especially numerous and important in the development of the child. Springing from fellowship in any pleasant activity like running, throwing balls or peek-a-boo, they expand into games involving organization or rhythm or both. Here we find the ring-games, the forms of which number hundreds, perhaps thousands. They usually make use of rhythmical movement and often verse or song. With very young children their interest is almost entirely that of activity, novelty, rhythm, harmony and social intercourse. Later, they involve some competition, especially in the form of seeking the favor of other children or older persons. With children of ten these simpler interests have developed into the fiercer joys of intense rivalry. The games become contests, where individuals or sides struggle for supremacy in strength, speed, skill or cunning. Of these the most important and elaborate are the various kinds of ball.

With man the social training afforded by the game may be said to overshadow that in bodily control and in knowledge. Through this activity the child learns the fine art of getting on with his fellows, how to co-operate, how to influence, how to lead, when to submit, when to seek help, when to resist, when to command, manners, customs, morals. In a word, the game socializes the child, and, since it is through social co-operation that man lives, this activity is a fundamentally im-

portant one educationally. With primitive races the festival, with its games, has been the principal agency for social intercourse on a large scale. Games were used to celebrate and cement alliances. They were early associated with religious observances, both having the same social and ethical function. From them sprang choral song, tragedy and comedy. Indeed, Schiller regarded the art-impulse as essentially the outgrowth of the tendency to play. Especially with social peoples like the Greeks has the game been allowed a great part in the life both of adult and child. With them it was the principal form of education.

The growth of a mass of learning which it was felt necessary to teach the young involved the substitution of the confinement and restraint of hard work for the freedom and spontaneity of play. This change in educational method was promoted by Christianity, which substituted the ideals of individual salvation and otherworldliness for that of racial and national prosperity and happiness. Asceticism despised the game as pleasant, and glorified the life of the hermit. In modern times the game has again received recognition as a most valuable educational agency, because of the emphasis thrown on the importance of interest (*q.v.*) and the fact that play affords the teacher a chance to introduce a living motive for learning what the school has to teach (see TEACHING, METHOD OF). Basedow (1723-1790) and Froebel (1782-1832) among educational reformers may be said to have done most to resurrect the game and give it a place in education. The latter was, of course, interested most in little children, but modern educators see that the use of the game in the school-room need not be confined to them. Indeed, reformers like Professor Dewey suggest that the life of the school may best take the form of social or group-activity in what may properly be called games. From this problems may be caused to spring, the solution of which may involve all the learning that the school desires to give. Reading, writing, arithmetic, science, history etc. as well as music, art and physical culture may thus be learned through the game. Even though not all school-life may be thus organized, it is recognized that the game may occasionally offer a very effective means of instruction. Finally, educators now realize the great importance of supervision of the play-ground sports of children (see PLAY-GROUNDS). For, while the game is the greatest school of social aptitude, it may corrupt as well as build up character. Children need to be taught how to play as well as how to work. Such instruction to be effective must, however, be given in so tactful a way as not to destroy the spontaneity of the game. See CHILD STUDY, INTEREST, METHOD OF TEACHING, PLAY-GROUNDS. Consult Gross: *The Play of Animals* and *The Play of Man*, published by Appleton & Co. E. N. HENDERSON.

Gametangium (*găm'ē-tăn'jĭ-ŭm*) (in plants) the organ in which the gametes or sexual cells are formed. Usually, it is applied only in case the gametes are alike in appearance and cannot be distinguished as male and female. In reality, however, the antheridium, oögonium and archegonium are all gametangia. See GAMETES.

Gamet'es, the sexual cells of plants, which fuse in pairs to form the oöspores or fertilized eggs. In the lower plants gametes are alike in size and activity, but in higher plants they become unlike. One kind remains small, usually has cilia, can swim actively and is known as the male cell or sperm (spermatozoid, antherozoid). The other kind becomes relatively very large, has no cilia and remains motionless, and is known as the female cell or egg (oösphere).

Gametophyte (*găm'ē-tō-fīt'*) (in plants), in alternation of generations (which see), the phase of the plant or generation which bears the sex-organs, that is, produces the gametes. In the mosses the gametophyte is the leafy plant, the most conspicuous part; in the ferns it is a very small, prostrate, heart-shaped body which is not usually seen; while in the flowering plants it is concealed from ordinary observation, although the endosperm of most seeds is part of a female gametophyte, that is, a gametophyte which produces the egg.

Gam'opet'alous Flowers, those in which the petals are more or less coalescent. Now mostly replaced by the word sympetalous, which see.

Gando (*găn'dō*) in western Sudan once an independent sultanate but now partly a British and partly a French possession, is on the upper Niger near the Sahara. It is inhabited chiefly by the Fulah, and is an exceedingly fertile region, the rainfall being abundant. The population is estimated at 5,000,000, and their religion is Mohammedanism.

Ganges (*găn'jēz*), the great river of northern India, rises in Gahrwal, on the southern slope of the Himalaya Mountains, issuing under the name of the Bhagirathi from an ice-cave 13,800 feet above the level of the sea. Its general course is southeasterly. At Allahabad it is joined by the Jumna, and farther down by the Son, Gandak and Kusi. At a distance of 220 miles in a straight line from the Bay of Bengal it begins to throw out the branches which inclose the level delta. The main channel, called the Padma or Padda, joins the Brahmaputra, and between this, the most easterly, and the Hugli, the most westerly mouth, lies the delta, with a multitude of mouths and channels. The

Ganges has a total length of 1,157 miles; its drainage-basin embraces over 390,000 square miles, lying between the Himalaya and Vindhya ranges and extending east to the mountains which separate Burma from Bengal. It in some sense is navigable from the point where it enters the lowlands to its mouth; its stream never fails in the hottest summer, and its floods distribute over the fields a rich top-dressing of soil. The Ganges is the most sacred river of India; from its source down to the sea every foot of Mother Ganges' course is holy. To bathe in her waters, according to the Brahman creed, will wash away sin; to die and be buried on her banks secures free entry to eternal bliss. Gangotri, Hardwar, Allahabad, Benares and Sugar Island, the most sacred spots, are visited by thousands of pilgrims every year. So potent is the religious influence of this stream that those who exclaim "Ganga, Ganga," even at a distance of a hundred leagues, atone for the sins committed during three previous lives.

Ganymede (*gan'i-mēd*), the cupbearer of Zeus, was, according to Homer, the son of King Tros. The most beautiful of mortals, he attracted the notice of the king of the gods, who determined to make him his cup bearer, to succeed Hebe, and so sent his eagle to carry him off to heaven. Zeus gave Tros a pair of divine horses to make up for his loss, and comforted him by telling him that Ganymede was now immortal. Ganymede was later, believed to be the same god that presided over the Nile. The Greeks placed him among the stars, under the name of Aquarius or the water-bearer. Ganymede was a favorite subject of ancient art, and to some extent is a favorite also of modern art.

Gapon, George, a Russian socialist and priest, was born in Biliki, Poltava, in southern Russia. As a boy he lived with his peasant parents, tending the sheep and cattle. At the age of twelve, he entered the lower Ecclesiastical School in Poltava. There he commenced to be influenced by the writings of Tolstoi. At sixteen he passed into the Ecclesiastical Seminary. For a few years following he taught in Poltava and there became ordained to the priesthood. Two years later he entered the Ecclesiastical Academy in St. Petersburg. About 1904 he formed a society called The Gathering of Russian Factory Hands of St. Petersburg. This was gradually enlarged, until it became a powerful band of socialists. Father Gapon led the Russians in their appeal to the czar in 1905, when he was shot. He was found hanged in April, 1906, in a country-home of Mme. Zverzhinskaia, in Oxorkow, Russia.

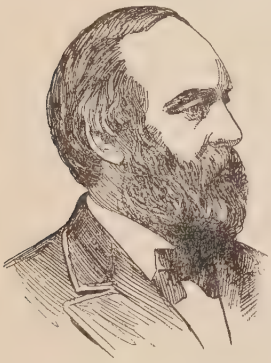
Garcia (*gär-thē'ä* or *gär-sē'ä*), **Calixto,** a Cuban insurgent-general, was born at Holguin, Cuba, Oct. 14, 1836, and died at Washington, D. C., Dec. 11, 1898. When the Ten Years' War broke out in 1868 under Céspedes, he joined the insurgents and rose to the rank of major-general. In 1873 he and his command were surprised by the Spanish forces and captured. Rather than surrender, Garcia placed the muzzle of his revolver beneath his chin and fired his last shot. The bullet came out between his eyes, but, though it marked him for life, did not kill him. After a long imprisonment in Spain he was pardoned and released, returning secretly to Cuba in September, 1895, when the new revolt occurred. In Cuba he coöperated with Gomez in the department of the East, and during the siege of Santiago by the United States forces he coöperated with General Shafter. In December, 1898, he was appointed head of a commission elected by the Cuban Assembly to visit Washington and confer with the United States authorities as to the future of Cuba. While at Washington, he died of an attack of pneumonia.

Gard'iner, Samuel Rawson, a modern English historian, was born in Hampshire, England, March 4, 1829. He was educated at Winchester and at Christ Church, Oxford, and for some years was professor of modern history at King's College, London. In 1885 he resigned his post to devote himself to writing. He has made a thorough study of the period of the first two Stuart kings in English history, and is the authority for that period. Besides his history of that period, he has also written a number of shorter works, among them *The Thirty Years' War* and *Introduction to the Study of English History.* His more ambitious works are *The Personal Government of Charles I; The Fall of the Monarchy of Charles I; History of the Great Civil War;* and *Constitutional Documents of the Puritan Revolution.*

Gard'ner, a town in Worcester County, Mass., 25 miles north of Worcester. It is the center of a large agricultural region, but is most important for its immense chair-factory. This establishment employs about 3,000 people, and manufactures almost every kind of chair. The town has two parks, a public library, an almshouse, a home for the aged, and a public bathhouse and swimming-pool costing $100,000. It is served by two branches of the Boston & Maine railway. Population, 16,163.

Gar'field, James Abram, the twentieth president of the United States, was born at Orange, Cuyahoga County, O., Nov. 19, 1831. His father died soon after his birth, and his early life was spent in poverty. He worked on a farm, and for three months was a canal boatman. He attended and taught in the public schools, studied at Hiram College, and finally graduated at Williams College in 1856 with high honors. The next

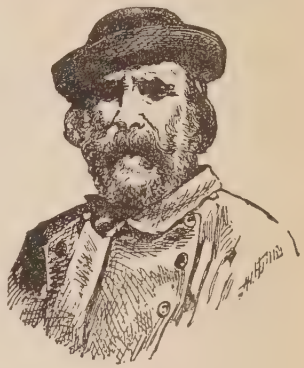
year he became president of Hiram College, and at the same time preached and studied law. He was elected to the state senate in 1859, and on the outbreak of the Civil War he became colonel of the 42d Ohio volunteers. For gallantry he was made brigadier-general, being the youngest of that rank in the service. He served at Shiloh and at Corinth, and in Alabama was appointed chief of staff of the Army of the Cumberland, and, again for gallantry at the battle of Chickamauga, was made a major-general of volunteers. He resigned shortly after to enter Congress, at thirty-two, where he remained until 1880, being, after the removal of Mr. Blaine to the senate in 1876, the recognized leader of the Republican side of the house. In 1880 he was elected a United States senator, nominated for the presidency at Chicago, and elected by the votes of nearly all the northern states. On July 2, 1881, four months after his inauguration, he was shot in the depot of the Baltimore and Ohio Railroad in Washington, by Charles Guiteau, a disappointed office-seeker. For months he lingered between life and death, and at last died on Sept. 19, 1881, at Elberon, N. J., where he had been taken in the hope of saving his life. Funeral services were held over his remains in the rotunda of the capitol, and he was buried at Cleveland, O. See *Life* by J. R. Gilmore.



JAMES A. GARFIELD

Garfield, James Rudolph, born in Ohio in 1865, is a son of President Garfield. He studied law at Columbia, after graduating from Williams College. In 1896 he became a Republican member of the senate of Ohio. From 1903 to 1907 he was commissioner of corporations in the Department of Commerce and Labor, discharging the trying duties of this office with great ability. In 1907-09 he was Secretary of the Interior.

Garibaldi (*găr'ĭ-bal'dĭ*), **Giuseppe,** an Italian patriot, was born at Nice, July 4, 1807. Beginning his career as a sailor, his voyages filled him with that democratic ardor which marked his whole life. In 1834 he was concerned in the Young Italy movement of Mazzini, and was condemned to death, but escaped and went to South America. Here he assisted the province of Rio Grande in its rebellion against the emperor of Brazil, distinguished himself as a guerrilla and privateer, and married a beautiful creole who became the companion of his early campaigns. After various adventures he entered the service of the Montevideans.



GIUSEPPE GARIBALDI

In 1848 he returned to his native country, and entered with ardor into the struggle for Italian independence. He won fresh laurels as a leader, but in the following year was compelled to leave Italy. He came to the United States, where he remained till 1854. He then once more sought Italy, and in 1859 the outbreak of the war of Italian liberation called him again to arms. He placed his sword at the disposal of Victor Emanuel, and though much hampered by conflicting parties, he and his Red Shirts, as his men were called, won many victories. He freed Naples and Sicily from the Bourbons and turned them over to Victor Emanuel. But in an attack on Rome he was wounded and captured. Soon after he made a journey to England, on behalf of Denmark, and was received with the wildest enthusiasm. In the Austro-Prussian War of 1866 he once more figured, and in another attack on Rome was captured, but escaped in a boat to Caprera, his island home. He came to the assistance of the French republic in its struggle with Germany, and was elected to the national French assembly.

During the latter part of his life he remained a helpless invalid at Caprera, except when he came forth to take his seat in the chamber of deputies at Rome. He died on June 2, 1882. Though Garibaldi made many mistakes, his patriotism is undoubted, and he will always remain a central figure in the story of Italian independence. See J. T. Brent's *Life of Garibaldi.*

Gar'land, Hamlin, American novelist and short-story writer, was born at West Salem in the La Crosse valley, Wis., Sept. 16, 1861, and was educated in Iowa and in Boston, Mass. Until 1881 he worked on his father's farm, spent some time in Dakota, then proceeded east, where he taught English literature in private schools in Boston and its neighborhood, and published his first book in 1890. Since then he has devoted himself to lecturing and writing. Besides a collection of verse, entitled *Prairie Songs,* he has published *Rose of Dutcher's Coolly; A Member of the Third House;*

Main Traveled Roads; Wayside Courtships; Prairie Folks; Ulysses Grant: His Life and Character; The Trial of the Gold-Seekers; and *Boy-Life on the Prairie.*

Garnet, a mineral found distributed in crystals through many crystalline rocks. The commonest form are crystals of 12 or 24 sides, and the commonest color is some shade of red, but brown, yellow, green and black varieties are known. All garnets contain much silica; in fact, they are silicates; the others' constituents vary, and they are divided into a number of groups, according to what they contain. Among the best-known kinds are alumina-lime garnets, alumina-iron garnets, lime-iron garnets, etc. They also have popular names, as cinnamon-store, oriental garnet, common garnet. The garnets of commerce are brought from Bohemia, Ceylon, Peru and Brazil; and the most esteemed kinds are commonly called Syrian garnets. The stones vary in size from the smallest that can be worked to the size of a hazelnut. Larger ones usually have flaws or impurities.

Garonne (*gȧ'rōn'*), the principal river in the southwest of France, rises within the Spanish frontier in the Pyrenees, 6,142 feet above the sea. Flowing in a general northwesterly direction, it is joined by several tributaries, and widening into the estuary which bears the name of the Gironde, about 50 miles long, enters the Atlantic at Pointe de Grave. The total length is about 346 miles, and it drains an area of some 22,020 square miles. Ocean-steamers go up the river as far as Bordeaux and small craft as far as Cazeres. At Toulouse it is joined by the Central Canal, which, running eastward to the Mediterranean, forms with the Garonne a means of communication between that sea and the Atlantic. The valley of the Garonne is noted for its beauty.

Gar'rick, David, a celebrated British actor and dramatist, was born at Hereford, England, Feb. 20, 1717. He studied for a few months under Samuel Johnson, and in 1737 master and pupil set out for London. After some preparation Garrick made his appearance as an actor in 1741. At first he played minor parts, but his success as Richard III was so great that the other theaters were deserted. In 1747 he became manager of Drury Lane theater, which he continued to direct till 1776, when he retired from the stage. During this period Garrick was the great attraction and played continually, his only rest being a trip to the Continent. He died on Jan. 20, 1779, and was buried in Westminster Abbey. As an actor Garrick occupies the first rank. He found the stage given over to formality and tradition, and in their place he left the impress of his own naturalness. He was equally at home in tragedy, comedy and farce. His dramatic productions are of little value. See Percy Fitzgerald's *Life of Garrick.*

Gar'rison, William Lloyd, an American journalist and abolitionist, was born at Newburyport, Mass., Dec. 10, 1805. After trying shoemaking and cabinet-making, he became a printer on the Newburyport *Herald*, and when only 16 began to write for the newspapers, trying to arouse an interest in the slavery-question. In 1824 he became editor of the *Herald* and accepted some of Whittier's earliest poems, when their author was yet unknown to fame. Later he became editor of the *Genius of Universal Emancipation* at Baltimore, and was imprisoned for his outspoken antislavery views. In 1831 he founded *The Liberator* in Boston, without capital or subscribers, a paper which he carried on until slavery was abolished. He was threatened with imprisonment and even with assassination, and a mob severely handled him in Boston in 1835, but he kept to his purpose. He made several visits to England in the interest of the cause he had taken up, and in 1833 he organized the American antislavery society, of which he was afterwards president. He continued his newspaper during the Civil War, and discontinued it in 1865, when the amendment to the constitution prohibiting slavery in the United States was adopted. The same year a number of his friends presented him with $30,000 as a memorial of his services. He died at New York, May 24, 1879. See *Life* by Johnson.

WM. L. GARRISON

Gar'ter, Order of the, the highest British order of knighthood, was originated by Edward III, probably on Jan. 18, 1344, to reward his most distinguished comrades in arms in his struggle with France. The story is told that the king was dancing with the countess of Salisbury, and when she happened to drop her garter, he picked it up and presented it to her, saying at the same time, in French, with reference to those who smiled at the action: "Dishonored be he who thinks ill of it," which became the motto of the order. It was founded in honor of the Holy Trinity, the Virgin Mary, St. George of Cappadocia and St. Edward the Confessor, but St. George is always accounted its special patron. The habit and badges of the order are the garter of dark-blue velvet, edged with gold, bearing the motto in golden letters, worn on the leg below the left knee; the mantle; the hood; the surcoat or gown; the hat; the plume; the golden collar; the George,

a figure of St. George on horseback meeting the dragon; the star; and the ribbon. The order consists of the sovereign and 25 knights and such descendants of George II as shall be elected, besides distinguished foreigners. The Prince of Wales, son of the ruling sovereign, is always a member. The members write the title K. G., Knight of the Garter, after their names. See Sir Harris Nicolas' *History of British Orders of Knighthood.*

Gary, Ind., about 22 miles southeast of Chicago on Lake Michigan, was established by the U. S. Steel Corporation in 1906 in connection with the location of the largest plant in the west. Within two years what had been sand dunes and swamp was occupied by a modern well-built city of several thousand inhabitants with a modern school system worked out on such original and practical lines that it was known throughout the country. Population about 20,000. See SCHOOL SYSTEM AT GARY.

Gas, a term applied to a vapor which cannot be condensed to a liquid at ordinary temperatures and pressures. Thus, in the ordinary conditions of the atmosphere, air is a gas, and other gases are oxygen, hydrogen, nitrogen etc. Gases have small densities as compared with liquids and solids; air, which is about 14 times as dense as hydrogen, is only about $\frac{1}{800}$ as dense as water. Gases have no definite surface boundary, but occupy any space within which they may be confined. With a given quantity of gas, the smaller the containing vessel the greater the pressure exerted on its walls; and it is true, for all practical purposes, that twice a given pressure reduces a given volume one half. If two gases be brought together, they will gradually mix with one another, even though the mixing has to take place in opposition to gravity. Thus, if a bottle of carbonic acid be connected by even a slender tube with a bottle of hydrogen placed above it, some of the heavy carbonic acid will make its way into the upper bottle, and a corresponding volume of the light hydrogen will descend into the lower, and within a few days the two gases will be completely mixed. The same thing will result even if the two gases be separated by a thin membrane or a piece of unglazed porcelain. Gases may, in many cases, be dissolved in liquids, as ammonia and carbonic-acid gas.

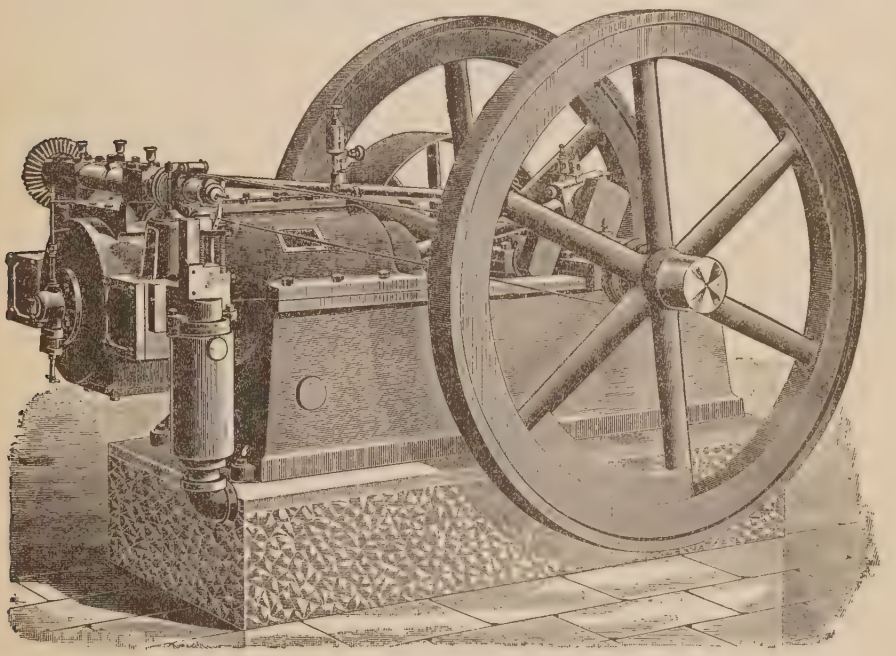
Of gases used for lighting or heating, there are various kinds. The most common kind is coal-gas, made from bituminous or soft coal. The principle of the manufacture of coal gas may be seen in the following experiment: Powder a little coal and put it into the bowl of a common, long tobacco-pipe; then cover the top with moist clay, let it dry, and then heat the bowl. Soon there will come out at the end of the pipe a yellow smoke, which is coal-gas, and this will burn when a light is brought to it; in the pipe is left some coke or carbon. In manufacturing this gas, instead of tobacco pipes, large ovens of brick or iron are used, called retorts. Large works may have a hundred furnaces, each of which has from five to ten retorts. The gas is purified by various processes from the other products of the coal, as tar and ammonia.

Other kinds of lighting gases are oil-gas, made from heavy mineral oils or, as in Australia, from waste mutton-fat, and used sometimes to light railroad-cars and steamships; water-gas, made by passing steam through glowing coke; wood-gas and peat-gas. Besides these artificial gases, an important gas, both for heating and lighting, is natural gas, which issues from the earth in many places. This gas has long been used in China, and near the Caspian Sea there are several so-called eternal fires which are supported by gas escaping from the soil. But it is chiefly in North America that natural gas has been found and used. It came into notice in connection with the digging of oil-wells, and was for a long time looked upon as a disadvantage. The general use of it for burning began only in 1872 in Pennsylvania. Many of the gas-wells lasted only four or five years, but some then sunk are still in use. Two years later manufactories began to use it, and one smelting company now uses a million cubic feet every hour. Natural gas is also found in Ohio, Indiana, Kentucky, Kansas, Dakota and (slightly) in California. It is believed by many that it will soon be exhausted. See Miller's *Chemical Physics.* See NATURAL GAS.

Gas-Engine, an engine driven by the force produced by the explosion of a mixture of air and a gas. A gas-engine is a form of internal-combustion engines, because the fuel, the gas, is burnt in the cylinder of the engine. The first gas-engine used practically was that of Lenoir (1860). Air and gas were drawn into the cylinder in suitable proportions, and, as soon as the inlet-valve was closed, the mixture was exploded by an electric spark. The cylinder was kept cool by a water-jacket. The engine was not economical. It used from four to five times as much as a good modern gas-engine. In 1866 Otto and Langen invented a gas-engine which used only about half the gas that Lenoir's engine did. The explosion occurred in a vertical cylinder under a piston which was driven up. The piston then came down under atmospheric pressure, and was in gear with the shaft only during the down stroke, so that the work was done only on the down stroke. It was very noisy and did not come into general use. In 1876

Otto brought out the present four-stroke cycle engine. It was a reinvention of an engine which had been patented in 1862 by Beau de Rochac, but had not been successfully introduced. In the Otto engine the mixture of air and gas is drawn into the cylinder during the second stroke; it is here exploded and during the third stroke expands; on the fourth and return stroke the cylinder is cleared for a new charge. This was the first gas-engine used extensively, and all the practical gas-engines of to-day show no marked departure from the Otto four-stroke cycle. The ignition of the mixture at the proper instant may be done by an electric spark, but is often done by a small gas-jet and a heated ignition-tube. The speed is generally regulated by a centrifugal governor (see GOVERNOR, ENGINE) which controls the supply of gas. Within a few years the use of gas-engines has increased very rapidly. Their adaptation for small powers was evident immediately. Even if the fuel-cost be greater than for a steam-engine, this is more than balanced by the convenience and economy in attendance. Then the gas-engine is costing nothing for fuel when it is at rest, so that it is specially adapted for places where power is only needed a fraction of the day.

But the efficiency of gas-engines in transforming the heat-energy of the fuel into work is from 20 to 25 per cent., twice that of small steam-engines, and, with cheaper fuel than ordinary illuminating gas, it is claimed that gas-engines compete with steam-engines for all-day loads. Recently the vapors of gasoline and petroleum have come into successful use as fuel for such engines. The oil-engine differs from the gas-engine only in being provided with some sort of vaporizer whereby the oil is converted from a liquid to a gas on its way to the cylinder. One of the remarkable exhibits at the Paris exhibition of 1900 was that of large gas-engines. The largest gas-engine at the Chicago world's-fair in 1893 was one of 35 H. P. At the Paris exposition of 1900 there was one engine of 1,000 H. P., and gas-engines giving a hundred H. P. or more were shown to be very common in practice to-day.



A GAS-ENGINE

The gas-motor of Mr. R. Diesel has attracted a great deal of attention from engineers. In the Diesel motor the compression of the mixture (vapor or gas) which was the feature of the Otto engine is carried still further, even to the point of raising the temperature of the mixture to ignition. Tests of this engine give the highest efficiency of any form of heat-engine, but the engine has not yet come into general commercial use.

A. P. CARMAN.

Gates, Horatio, an American general, was born in England in 1728, and, entering the British army, was an officer under Braddock, at whose defeat in 1755 he was

severely wounded. He settled on an estate in Virginia, and at the outbreak of the Revolution he espoused the cause of his adopted country, and in June, 1776, was given the chief command of the army which had just retreated from Canada. In the following year he succeeded Schuyler in the command of the northern army; and the defeat and surrender of the British army under Burgoyne, at Saratoga, which followed, gave Gates a brilliant reputation, though the glory belonged in some measure, at least, to Schuyler. Soon afterwards the so-called Conway cabal intrigued to give the supreme command, which Washington held, to Gates, and after that Gates held no command, until in 1780 he was made commander of the southern forces. The disastrous battle of Camden on August 16 deprived him of his military laurels. He was superseded, and was not acquitted of blame by court-martial until 1782. Two years later he freed all his slaves, and settled in New York, where he died April 10, 1806.

Gatineau. Important river 400 miles long in the province of Quebec. Empties into the Ottawa River. Of great commercial importance to the immense lumber-interests of the Ottawa Valley. The whole of the Gatineau valley, comprising an area of 10,000 square miles, is traversed by it. The water power of the cascades on this river is calculated to equal 40,000 H. P. and the rapids of St. Joseph and Des Eaux at 7,700 H. P.

Gat'ling, Richard Jordan, American inventor, of Gatling-gun fame, was born in Hertford County, N. C., Sept. 12, 1818. Early in life he assisted his father in constructing a machine for sowing cotton-seed, and himself invented a machine for sowing rice, which he later adopted for sowing wheat. In 1862 he invented the revolving gun known by his name, and in 1886 invented a new gun-metal, consisting of steel and aluminum. He also invented a steam-plow and a hemp-breaking machine. Congress voted him $40,000 for proof-experiments in a new method of casting cannon. He died on Feb. 26, 1903.

Gaul. See FRANCE.

Gauss (*gous*), **Karl Friedrich,** a noted German mathematician, physicist and astronomer was born at Brunswick, April 23, 1777, and died in Göttingen in 1855. In his 30th year he was appointed director of the observatory at Göttingen, where he spent the remainder of his life. At 25 he had published a very important mathematical paper; at 32 he published his great work on mathematical astronomy, entitled *Theory of Motion of Celestial Bodies.*

In conjunction with Wilhelm Weber, professor of physics in the University of Göttingen, he made an elaborate and profound study of the earth's magnetism and instituted our modern system of absolute magnetic measurements. To Gauss is also due our only satisfactory and accurate method of discussing optical instruments.

Gautier (*gō'tyā'*), **Théophile,** a distinguished French novelist and *littérateur*, was born at Tarbes, Aug. 31, 1811, and died at Neuilly, Oct. 22, 1872. He began life as an artist, but abandoned painting for literature. Early in his career, having become acquainted with Victor Hugo, he threw himself into the romantic movement, which at this time manifested itself in French literature. In 1835 appeared his notable novel, *Mademoiselle de Maupin*, which, in spite of its licentiousness, established its author's fame. After this followed a number of essays and sketches in literary criticism, including two admirable monographs on Lamartine and Charles Baudelaire. Later he traveled considerably, producing, as the result of his tours, a series of delightful works on Spain, Algeria, Italy, Belgium, Holland, Russia, Constantinople and Athens. Returning to fiction, he wrote *Captain Fracasse*, *Spirite* and *The Romance of the Mummy*, all full of captivating writing; together with a number of brilliant short stories, of which the most striking, perhaps, is *A Night with Cleopatra.* He also produced many short plays for the stage, besides a *History of French Dramatic Art* (since 1845) and numberless scattered pieces in prose and verse. He possessed, with eminent descriptive powers, a delightfully facile style and great artistic taste. His last book, written during the German siege of Paris, was his *Siege Pictures.*

Gay, John, an English poet, was born in 1685 and died in 1732. He wrote a large number of poems and ballads, besides several operas; but little of his poetry is now read. His greatest success was *The Beggar's Opera*, which ran 62 nights, made the actors celebrated, and in the popular phrase, "made Rich [the manager] gay, and Gay [the author] rich." His *Fables* and his ballad of *Black-eyed Susan* also deserve mention. See Henry Morley's *English Literature.*

Gay-Lussac (*gā'lü'sàk'*), **Joseph Louis,** a French physicist and chemist, was born Dec. 6, 1778, and died at Paris, May 9, 1850. His father's name was Antoine Gay, to which the title Lussac was added, in connection with the ownership of some property. Gay-Lussac was educated at the Polytechnic School in Paris, which he entered at 19. In 1804 he made a great reputation by ascending alone in a balloon to the height of 23,000 feet and there making observations on the earth's magnetism, the moisture of the air etc. For 24 years, beginning in 1808, he was professor of physic in the Sorbonne which he left to become pro-

fessor of chemistry at the *Jardin des Plantes*.

One of his most important pieces of work is that in which he proves that, when gases combine with one another by volume, they do so in simple proportions. Thus two volumes of hydrogen combine with one volume of oxygen to form two volumes of water. Equally important, perhaps, is his discovery of the manner in which gases change volume or pressure when the temperature changes. For description of this, see BOYLE'S LAW.

Among his chemical investigations, perhaps his demonstrations of the nature of iodine and of hydrochloric acid are as important as any. In addition to his scientific accomplishments, he was a man of extraordinary breadth, a member of the Chamber of Deputies, widely traveled and largely acquainted with men.

Gazelle. See ANTELOPE.

Geary, John White, American soldier and governor of Pennsylvania, was born near Mount Pleasant, Pa., Dec. 30 1819, and died at Harrisburg, Pa., Feb. 8, 1873. Early in life he studied law, but never practiced. During the Mexican War he acted as colonel of the 2d Pennsylvania regiment, and was made first commander of the City of Mexico. In 1849 he was appointed postmaster of San Francisco, and in the following year became mayor of the city. In 1856 he was created territorial governor of Kansas. At the opening of the Civil War he raised the 28th Pennsylvania volunteers and rose to the rank of major-general. He took part in many notable engagements and was with Sherman in his march to the sea. In 1866 he became governor of Pennsylvania and held the office until his death.

GENERAL GEARY

Gehenna (*ge-hĕn'ȧ*) or, in Hebrew, **Valley of Hinnom,** was a narrow gorge south and west of Jerusalem. Under the later Jewish kings it became a favorite place for the celebration of idolatrous rites, and when King Josiah restored the old national faith, he "defiled" the valley by covering it with human bones. After this it became the common cesspool of the city, into which its sewage was brought, to be carried off by the waters of the brook Kedron. It is also said that fires were kept constantly burning here to consume the bodies of criminals, the carcasses of animals and whatever else could be burned. Among the later Jews Gehenna and Tophet came to be symbols for hell and torment.

Geijer (*yī'ȧr*) **Eric Gustaf,** a noted Swedish historian, was born in Wermland, Jan. 12, 1783. Devoting himself to the study of history, he became professor of that branch in the University of Upsala. He also wrote poems and political essays, and was known as a composer and musician. He died on April 23, 1847. His historical works are chiefly confined to the history of his own country.

Geikie (*gē'kĭ*), **Sir Archibald,** F. R. S., director-general of the British geological survey and an eminent authority in geological science, was born at Edinburgh, Scotland, Dec. 28, 1835, and educated at the high school there and Edinburgh University. In 1855 he entered the geological survey and rose to be director-general of the geological survey of Scotland and first Murchison professor of geology and mineralogy at the University of Edinburgh. He has been president of the British Association and of the geological society, and is director-general of the geological survey of the United Kingdom. He has written largely on his special topics, and received many foreign decorations and honors. His chief books are *The Story of a Boulder, Textbook of Geology; Field Geology; Classbook of Geology; The Ancient Volcanoes of Britain;* and he has written biographies of *Edward Forbes, James D. Forbes, Sir Roderick Murchison, Sir Andrew Crombie Ramsay* and other eminent scientists.

SIR ARCHIBALD GEIKIE

Gem'mae (in plants), peculiar reproductive bodies formed mostly by certain liverworts. Each gemma is a disk-shaped mass of cells, and on being separated from the plant it produces a new body. See HEPATICÆ.

Gen'erative Cell (in plants), a general phrase, but technically a cell which is enveloped within pollen-grains, and which gives rise more or less directly to the male cells or sperms. It is a cell which appears in connection with the very small male gametophyte which the pollen (an asexual spore) produces.

Genet (*zhĕ nā*), **Edmond Charles Edouard,** a French diplomatist, was born at Ver-

sailles in 1765, and died at Schodack, New York in 1834. At an early age he showed considerable talent as a linguist. After serving for three years in diplomatic service in St. Petersburg, in 1792 he became minister plenipotentiary to the United States. His mission was to have them declare war against England. He was well-received on his arrival and soon began to seek recruits through agents. As Washington, however, had assumed a position of neutrality, Genet was soon notified by Jefferson, then secretary of state, that he must cease to arm and equip privateers in American ports. As he did not obey Jefferson's command, he was recalled by the French government upon the request of Washington. He afterwards became a naturalized American citizen, and married a daughter of Governor George Clinton of New York.

Geneva, Lake of, or **Lac Leman,** lies between Switzerland (to which the greater part of it belongs) and France. It is 1,218 feet above the sea, and stretches 45 miles from east to west in the form of a crescent. Its greatest breadth is 9 miles, its area 223 square miles, and its greatest depth 1,092 feet. The northern shore is a classic spot, celebrated by Rousseau; and by Byron in *Childe Harold* and *The Prisoner of Chillon.* The southern shore has as a background the mountains of Savoy. From the lake Mount Blanc is visible, and, although 60 miles distant, is often reflected in its waters.

Geneva, N. Y., a town in Ontario County, on Seneca Lake, 50 miles southeast of Rochester. It is advantageously situated on high ground, and is the seat of Hobart College, the State Agricultural Experimental Station and of the Delancey Divinity School and school for girls. It is noted for its extensive nurseries. It has a good high-school and well-equipped grammar and kindergarten schools, fine churches and an hygienic institute. It has numerous factories, including stove-foundries, steam-heating boilers, optical works and a fruit-preserving establishment. Population 12,446.

Geneva, capital of the Swiss canton of the same name, is situated at the point where the Rhone leaves Lake Geneva. A Gallic town originally, it fell successively into the hands of Romans, Burgundians and Franks, and, having become the seat of a bishop, a continual feud was carried on from the 12th century between the bishop and the counts and dukes of Savoy. In the meantime the citizens gained considerable liberty, and, in the 16th century, by allying itself with Freiburg and Bern, the republic of Geneva won complete independence. A few years later the republic became Protestant, and Calvin came to Geneva and made it one of the chief strongholds of Protestantism in Europe. During the 18th century it was torn by party strife, and during the French revolution the government was overthrown, and a reign of terror followed. Annexed to France, it again became independent, and in 1815 the city, with its adjoining territory, joined the Swiss confederation as the 22d canton with a representation of seven members in the Swiss National Council. There have since been several conflicts between the popular and aristocratic parties.

Formerly surrounded by walls and in other respects an ancient town, Geneva within the last half-century has become a beautiful and convenient modern city. The Rhone, passing through, forms two islands, on one of which still exists an antique and picturesque cluster of buildings; on the other, laid out as a pleasure-ground, is the statue of Rousseau. Among the fine buildings are a cathedral, which dates back to the 12th century; the university (with 1,158 students and a teaching-staff of 133 members), founded as an academy by Calvin; one of the finest theaters in Europe; and a number of valuable museums. Geneva is famous as a theological, scientific and literary center, and has given birth to many great men, among them being Rousseau, Necker (the famous French minister of finance and father of Madame de Stael), Sismondi, Casaubon, De Candolle and Cherbuliez. Watches, musical boxes and jewelry are the staple manufactures. Geneva is also a canton of Switzerland, with an area of 108 square miles and a population of 150,173. Population of the city 125,520

Genghis Khan (*jen'gĭs kän'*), meaning Very Mighty Ruler, a celebrated Mongol conqueror, was born in 1162, at Deylum Yeldâk, on the River Onon. The son of a Mongol chief, he was called upon to rule his father's people when only 13 years old, and he had to struggle hard for several years against revolts and factions. He was ambitious for conquest, and, starting with a dominion comprising most of the region between the Amur and the Great Wall of China, he conquered empires stretching from the Black Sea to the Pacific, and organized them into states which endured far beyond the short span that usually measures the life of Asiatic kingdoms. He subdued, one after the other, the Keraits; the Naimans, a powerful Turkish confederacy; Tangut, a Chinese empire near the desert of Gobi; and the empire of North China. He then turned westward and conquered as far as India, the Persian Gulf and the Black Sea. Two of his generals even passed through southern Russia, and entered the Crimea, everywhere routing and slaying, and returned by way of Great Bulgaria and the Volga,

a wonderful military raid. Genghis died in 1227. See Howorthy's *History of the Mongols* and also Curtin's.

Gennesaret, Lake. See GALILEE.

Gen'oa, a city of Italy, situated on the Mediterranean gulf of the same name, at the foot of the Apennines. It is an important seaport and the capital of a province. The province has an area of 1,582 square miles with a population of 989,538. The slopes of the hills behind the city, down to the shore, are covered with buildings, terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges, rising still farther back, are capped with a line of strong forts, batteries and outworks. The fine half-circle harbor, protected by piers and moles affords an outlet for the products of a wide extent of country — rice, iron, olive oil, silk goods, coral, paper, macaroni and marble. Over 6,000 vessels enter the port yearly, three fourths being Italian. Among the industries are iron-works, macaroni-works and paper-factories. There are many palaces, interesting because of their historical fame and architectural beauty, and some of them contain valuable galleries of paintings. The fine old churches also are splendid with marbles, paintings and rich gildings, among them the Gothic cathedral of St. Lorenzo, built in the 12th century. The university, founded in 1243, with 64 teachers and 1,276 students and auditors, has a library of 120,000 volumes, and there are other academies and schools and one of the finest theaters in Italy.

The history of Genoa presents much the same features as other ancient Italian cities. After falling under the sway of several powers, it became an independent republic, and to protect itself against the Saracens it formed an alliance with Pisa. At the close of the 11th century Genoa commanded large naval forces, and ranked as a powerful naval state, its main power being in its commerce. Internal troubles and wars with Pisa, Venice and the Moors followed, and it again became a subject-state of Milan and then of France. In the 16th century Andrea Doria restored the republic, but it again became a part of France, and in the past century was made a part of the kingdom of Italy. The Genoese are skillful and hardy seamen, and are noted for their spirit of enterprise and freedom. Among the sights of the city is a monument to Columbus, the most famous citizen of Genoa. Population 275,000. See J. T. Bent's *Genoa.*

Genseric (*jĕn'sēr-ĭk*), the greatest of the kings of the Vandals, was, with his brother Gonderic, ruler of the Vandals after their settlement in Spain. After crushing the Suevi, he led the united Vandals and Alans into Africa in 429 A. D. All Africa west of Carthage fell into his hands. Seizing that city in 439, he made it the capital of his new dominions, and dated his reign, which lasted thirty-seven years, from this conquest. With such cruelty and ferocity did the Vandals lay waste cities, churches and fields, that their name is still used to describe barbarous acts. Genseric quickly built up a great naval power, and his fleets scoured the Mediterranean. In 455 he captured Rome and plundered it for fourteen days. Two expeditions sent to avenge this insult were completely destroyed. Genseric died in 477, to the last holding all his conquests. With great genius as a conqueror and ruler, he made religion the excuse for ruthless cruelty. Once, when leaving the harbor of Carthage on an expedition, his pilot asked him whither he was going. "Against all who have incurred the wrath of God," said the conqueror. He was of low stature, and lame on account of a fall from his horse, always absorbed in his plans, caring little for pleasure, subject to bursts of fury and greedy of conquest.

Gentian (*jĕn'shan*), a widely distributed genus of plants, is of use in medicine for the bitter drug that is made from the roots and used to stimulate the appetite. The common yellow gentian which is so employed abounds at a high altitude in Asia Minor, the Alps and the Pyrenees. The abundant yellow flowers of this gentian, growing upon stems some three feet in height, make it one of the beauties of the mountains. Species of gentian are found not only in Europe and Asia, but in North and South America and even New Zealand. The gentian can only with the greatest difficulty be cultivated as a garden-plant.

FRINGED GENTIAN

Geof'frey of Anjou. Geoffrey (or Geoffry), Count of Anjou and Maine, provinces in France, married Matilda, daughter of Henry I, King of England. On the death

of William, Henry's son, Matilda became heir to the English crown and to the duchy of Normandy; but these were seized by the more popular Stephen. In Matilda's fight for the crown Geoffrey took little part; but he fought unsuccessfully for the possession of Normandy. He died about 1150. His son, Henry, won Normandy in 1151, and made a treaty with the childless Stephen, securing his succession to the English crown as Henry II. Thus Geoffrey, a descendant of the terrible Count Fulc of Anjou, is the ancestor of all succeeding English monarchs. He gained the title Plantagenet from his habit of wearing in his helmet the common broom of Anjou (*planta genista*) His descendants received this title as a surname.

Geog'raphy means strictly a description of the earth. As now used, it is that branch of science which treats of the features of the earth's surface, the division into countries and the plants and animals, including man, which cover it. It may be divided into *physical geography*, dealing with the form and motions of the earth, the atmosphere or air-covering, the land-surface and the water-covering, the facts that make up climate, the great classes of rocks that make up the surface and the leading classes of plants and animals which cover it; and *political geography*, giving an account of the different states or communities into which man is divided. The terms commercial geography, which discusses the products and commerce of the different parts of the world; medical geography, dealing with different places as liable to certain diseases; and oceanography, which investigates the ocean and its inhabitants, are also sometimes used. Thus the study of geography touches in various ways upon many other sciences, as geology, history and astronomy.

The progress of geographical knowledge has depended largely on the progress of discovery. The Phœnicians were the first people who communicated to other nations a knowledge of distant lands. Their voyages before the time of Homer, through the Euxine, the Mediterranean and even into the Atlantic form the first link of the great chain of discovery which, centuries later, was extended by Columbus to the shores of America. Travelers like the Greek historian, Herodotus, whose *History* gives a complete representation of what was known of the earth's surface in his age, did much for the advancement of geography, as did also the exploring and surveying expeditions of Alexander the Great. At the same time Pytheas, the Massilian navigator, was following the path of discovery in the north, possibly as far as Iceland, and in 276 B. C. Eratosthenes first used parallels of longitude and latitude and made maps on mathematical principles. By this time the old idea of the earth as a flat, circular shield surrounded by a rim of water had given place to the belief that the earth is a sphere, revolving with the surrounding atmosphere on one and the same axis. The practical genius of the Romans led them to make a study of the resources of the countries they conquered, which did much for geography. Their greatest work was a survey of the whole empire, including a description and measurement of each province, which was made under Cæsar and Augustus. In the second century of our era Ptolemy wrote a work on geography, in eight books, which for many centuries was regarded as the most perfect system of the science.

The travels of the Venetian, Marco Polo, in the 14th century opened new fields of inquiry, and the close of the next century was marked by the discovery of the American continent. Within thirty years the whole coast of America, from Greenland to Cape Horn, had been explored; the Pacific Ocean had been navigated by Magellan and the world circumnavigated by his ship; the coasts of eastern Africa, Arabia, Persia and India had been visited; and numerous islands in the Indian Ocean discovered. The attempts to find a northwest passage to India increased the knowledge of the Arctic regions. Captain Cook by his long voyages dispelled the old belief in the existence of a great Antarctic continent, and the Antarctic lands have been visited during the 19th and 20th centuries. In the 17th century the Dutch made the Australian islands (which the Portuguese had discovered about 1500 or else in 1601) known to the world, but it was not until within a few years that the first successful voyage was made through the northeast passage around Europe and Asia and through the northwest one around America. In America the travels of Humboldt, Lewis and Clarke, Frémont and others and the work of the United States and Canadian surveys have done much to add to our scientific knowledge. Africa, Asia and Australia are pretty well-known, but are still lands of exploration, though great areas in each have been opened in recent years. Commander Peary, U. S. N., who on April 6, 1909, reached the long sought North Pole; and Nansen; and Sven Hedin in Tibet in 1906–8 are but a few of the many who have enormously extended geographical knowledge recently. The work of making geography is still going on, and is constantly becoming more complete and important. Among the most valuable efforts in this direction may be mentioned the deep-sea exploring expeditions. See PHYSIOGRAPHY

Geography, Teaching of. Geography is the study of the earth's surface as the

HUMAN HABITATIONS

1—Eskimo Circular Snow Hut. 2—Gipsy Hut, Croatia, Hungary. 3—Hut in Brazil. 4—Pioneer Log Cabin. 5—Home in Sumatra. 6—Congo Hut, made of leaves. 7—Indian Tepees. 8—Porto Rican Hut. 9—Floating Village, Congo, Africa. 10—Southern Mansion, United States.

DWELLINGS OF DIFFERENT COUNTRIES AND PEOPLES

11—Mexican Adobe Hut. 12—Pueblo Indian Dwelling. 13—Hut in the Friendly Islands, Oceanica. 14—Icelandic Hut. 15—Borneo Dwelling. 16—Modern American Dwelling. 17—Fijian Hut. 18—Modern Business Building, Sky Scraper. 19—Kaffir Hut, South Africa.

home of man. It differs from physiography in this: that while physiography deals with the question how the earth came to be what it is, geography devotes itself to the effects of surface features upon mankind. The chief characteristic of the study is the relativity of man to his home, and not, as often assumed, a mere description of the earth's surface. Neither is the study of man alone any nearer approach to geography but, if anything, a wider departure. Not the home alone, nor man himself, but man in his home,—that is the function of geography proper. To Karl Ritter, the first great teacher of the subject, is due the credit of the present view of the true field of geography. The best-adapted definition of Ritter's somewhat involved one is, possibly, that of E. C. K. Gonner of University College, Liverpool. *Geography may be described as the meaning to man of the earth and its features as they are.*

Such being the scope of the subject, it is possible for its study to begin in the first grade. The outline of a course of study in geography, given by F. W. Parker in his treatise on *How to Study Geography*, is suggestive for all the grades, but that part of it which deals with the work of the first grade deserves distinctive mention. It aims to help the child to find himself, to realize his environment and the relations, so far as he may be capable of observing them, that exist between himself and his home. So taught, it must follow that the child will recognize the meaning which relates the Eskimo to the tundra, the Tibetan to the plateau, the Kirghiz to the steppe, the Negrito to the forest and the Troglodyte to his cave. Studied in the way indicated, strange people will not necessarily seem "freaks," nor other parts of the earth "out of his world." His larger knowledge must increase his humanity, and enhance his appreciation of the earth.

In the first three years of school there is scarcely any need of a separate "study" called geography, such work as that just mentioned being incidental to a study of primitive life, nature-study and other subjects.

But in the fourth or, at latest, in the fifth year of school, geography should find a separate place in the program of studies. The first large subject should be home-geography, in which one takes up systematically the study of the home environment. Most of the principal ideas used in geography can be gotten by careful observation of one's home-surroundings. In this way later geography can be founded on a concrete basis.

The worth of later geography depends very much upon the prominence given to the causal idea. The work is dead, if this idea is omitted and the effort is directed chiefly to location. Here is found the chief difference between the old geography and the new; the former was descriptive and static, the latter is causal and dynamic. If one conceives of the whole earth as a developing body and of the various industries as developing in each country under the influence of *causes*, the study will prove thoroughly interesting and energizing. And that is what modern school geography endeavors to do.

As aids to geography-teaching, a magnet, a compass, a dipping needle, a dial, a weather-vane, a rain-gauge, a thermometer, a barometer, stencils, colored crayon and small papier-maché globes will be found useful from the first, although good work can be done without many of these. For advanced work there are numerous more complex pieces of apparatus that are of value.

If there is one thing needing emphasis in geography teaching, it is more laboratory work, more of the fields, more of the world about us and less of books. Study of the home, therefore, is not to be considered as *finished* after a few months of work upon it in the fourth or fifth year of school.

Geography logically begins with nature study, and develops through an extension of community environment to continental and world environment. It includes such a variety of surface, meteorological, climatic, biological, industrial, commercial, social and political problems, that local material need never be wanting; neither need concrete illustrations in great variety be lacking as the vision of the pupil is extending beyond his own neighborhood.

The making of models representing groups of people in typical settings of the regions which they inhabit will always prove interesting and instructive. A lesson in modeling groups to represent *The Seven Little Sisters* will not fail to satisfy the teacher of the advantage of such work.

The sources of information on this subject other than the regular texts are authenticated cuttings from newspapers, articles in magazines, bits of personal experiences and books of travel, of which there are now hundreds written in a most delightful manner. Such books as Nansen's *Farthest North*, Abruzzi's *The Ascent of Mt. St. Elias*, Hedin's *The Roof of the World* and Borchgrevink's *Story of the Farthest South* are of especial worth, bringing to the class reliable matter rendered doubly interesting by the intensely personal flavor of the recital. It is to be doubted whether there is a better set of books in any single series for geographical work than Reclus' *The Earth and its Inhabitants*. The voluminous publications by our state and national government are also of great value.

For the teacher *The Statesman's Year-Book*, Redway's *The New Basis of Geography*, *The International Geography*, edited by H. R.

Mill, and Adams' *Commercial Geography* are almost indispensable. It should go without saying, of course, that every class-room for the scientific teaching of geography should be supplied with a globe, up-to-date maps, atlases, gazetteers and current geographical magazines.

Ge'olog'ical Survey, United States, is a bureau that was organized by the Department of the Interior in 1879 to bring together the scattered surveys of many western districts and construct geological maps of the United States. The bureau continues to pursue its investigations concerning the products of the country, its mineral resources and the means and possibilities of irrigation. The maps are made in such detail that the scale is never less than four miles to the inch; and is often as large as one mile to the inch. The heights of places are shown by lines, called contours, which represent an equal distance above sea-level. The maps, as they are made, are at once published in folios. The director of the survey issues an annual report. Full information upon the work of the bureau may be gained from the reports of the director, together with Walcott's *The United States Geological Survey*, Washington, 1895.

Geol'ogy. Geology is the science which deals with the history of the earth. It is the task of geology, not simply to recite the history of the earth so far as it is known, but to show how this history became known and how the limits of knowledge are being extended. Geology is a young science, and in its study at the present time it is needful to take cognizance of the limitations of present knowledge as well as of the knowledge itself. Everything which throws light on the history of the earth falls within the field of geology. The history of the atmosphere and the history of the ocean are really parts of geology, since the atmosphere and the ocean are parts of the earth. The popular impression, therefore, that geology has to do only with the rocks of the earth is not altogether adequate. The rocks of the earth, to be sure, furnish the larger part of the data for unraveling the history of the earth, though they are not the only sources of information. It is to be remembered, too, that in the study of the rocks, it is study of them for the sake of the light they throw on earth-history, rather than study of them for their own sake, with which the geologist is primarily concerned.

In working out the history of the earth, so far as it has been worked out, the line of approach has been through the study of the changes which are now taking place on the earth's surface. The rain falls on the land, and some of it gathers into streams, and the streams flow into the sea. In the flow of the water the substance of the land is worn away, the material carried to the sea and deposited there in the form of gravel, sand, mud etc. The sand and mud need nothing but cementation to become sandstone and shale, two of the commonest sorts of rock found on the land. The process of cementation is now going on by natural means in many places. In the sand and the mud, as they are deposited in the sea, shells of various organisms are often imbedded. The shale and sandstone of the land also contain shells and other traces of marine organisms. Hence it is inferred that the sandstone and shale, as well as certain other sorts of rock found on the land, were originally deposited as beds of sand and mud, etc in the sea and that they have since been elevated to the condition of land.

The activities of other surface-agencies are similarly studied. The detailed study of the work now being done by rain and rivers, underground water, waves and currents, the atmosphere, glaciers, changes of temperature, gravity, organic agencies and all other forces and activities operative on the surface of the earth has taught geologists how to interpret the rocks formed in ages long past. It is by the interpretation of the recorded results of the past, in the light of the processes now taking place, that the science of geology has grown up. The study of present processes is becoming more and more exhaustive, and the application of this increased knowledge of present processes to the records of the past is continually enlarging and perfecting our knowledge of the earth's history.

Geology should begin with the origin of the earth, and at this point it trenches upon the field of astronomy. The early ages of the earth's history are as yet speculative. There seems to be good reason for doubting the truth of the nebular hypothesis, which has so long been regarded as satisfactory. The only rival hypothesis which has been framed is the meteoric hypothesis, which affirms that the earth is made up of an aggregation of meteorites comparable to the meteorites and shooting stars, which daily reach the earth by millions at the present time. While the stages of the earth's history preceding the beginning of sedimentation are, at the present time, largely conjectural, many lines of investigation are being pursued which ultimately may throw much light on the early and obscure portions of the earth's history. The general outlines of this history since sedimentation began are probably fairly well-understood, though increased knowledge may modify present conceptions at many points.

The rocks of the earth which contain the principal records of the earth's history are of three great classes: (1) Igneous rocks or those which represent solidified lava; (2) sedimentary rocks, as shale, sandstone, con-

glomerate, etc., most of which are made up of fragments of older rocks; and (3) metamorphic rocks, which may have been so far altered by various means that they now depart notably from the original forms. In the metamorphism of rocks pressure is the most potent agent. Chemical change, under the influence of moisture, is probably second in importance; and heat third. A special class of sedimentary rocks is due to life. Here belong most limestones, made of shells, corals, etc.; coal, of plant origin; and a number of lesser formations.

The composition, disposition and structure of these several sorts of rock and their fossil contents, so far as they contain fossils, interpreted in the light of processes now taking place, allow geologists to infer the conditions under which the various sorts of rocks are made. When geologists are able to tell what the conditions were on every part of the earth at every period of the past, the science of geology will be complete.

Several subdivisions of geology are often recognized. *Dynamic geology* deals with the agents and forces which have been concerned in making the earth what it is. To dynamic geology belongs the consideration of the activities of rivers, the atmosphere and the ocean, the forces concerned in volcanic action, crustal movements, etc. *Petrography* is that phase of geology which deals with the rocks as such. *Structural geology* is that branch of the subject which deals with the positions of rock-strata and with the relations of rock formations to one another. Structural geology might be defined as the architecture of the crust of the earth. *Physiographic geology* deals with the forms of the surface, and its task is to explain how the present surface came to be as it is. It draws extensively on dynamic geology, since it must consider the forces which have produced mountains, plateaus and plains as well as the details of their surfaces. It draws on structural geology, because the positions in which the rocks occur influence the shape of the surface at the present time. It draws on petrography, because the form of the surface is often affected by the character of the rock beneath. *Paleontologic geology* is that phase of the subject which deals with fossils. The objective point of paleontologic geology is to determine the character of the life of successive ages and the changes which it underwent from time to time. *Historic geology* is that phase of the subject which deals with the application of all other phases of geology to the task of making out the history of the earth, as shown in the rock formations. *Economic geology* is that phase of the subject which deals with the materials of the earth's crust which are commercially valuable. It has to do with ores of all sorts; with coal; with building-stone; with clays which are valuable for the manufacture of brick, pottery, etc.; with materials which can be used for pigments; sand, which can be used for glass; with precious stones; with abrasive materials; with asphaltum, petroleum, natural gas, salt, fertilizers etc. The function of economic geology is to determine the origin of these substances and, so far as possible, the laws which govern their distribution.

Geologic time is divided into five eras and most of these are divided into several periods, as shown in the following table:

ERAS	PERIODS	
Cenozoic....	Pleistocene (Glacial)	
	Pliocene	Tertiary
	Miocene	Tertiary
	Eocene	Tertiary
Mesozoic....	Cretaceous	
	Jurassic	
	Triassic	
Paleozoic...	Permian	
	Carboniferous	
	Devonian	
	Silurian (= Upper Silurian)	
	Ordovician (= Lower Silurian)	
	Cambrian	
Proterozoic.....	Algonkian	
Archean.....	Archean	

The Archean era was the time occupied in the making of the oldest system of rocks. The Archean rocks are mostly metamorphosed igneous rocks, though with them there are some metamorphic sedimentary rocks. Fossils have not been found in this system of rocks, but it cannot be asserted that life did not exist.

The Proterozoic era is the time during which the great system of rocks lying above the Archean and below the oldest abundant fossiliferous rocks was deposited. The rocks of the Proterozoic era are mainly sedimentary, though igneous rocks have great development locally. The formations of the Proterozoic era are many thousands of feet thick, though considerable portions have been removed by erosion. It has been estimated that the Proterozoic era was perhaps as long as all subsequent time. Life existed during this era, as is shown by the few fossils which have been found and by the nature of some of the formations, even where definite fossils do not occur. For example, there are black shales and graphitic slates, the carbon of which probably is of plant-origin. The Proterozoic (Algonkian) rocks of the Lake Superior region contain rich beds of iron and copper.

The Paleozoic (formerly called Primary) era was the time when the several systems of rocks bearing the names Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian were deposited. The time occupied in the deposition of each of these systems is a period. These systems of rocks are mainly of sedimentary origin, and the materials of which they are composed were derived from the land-areas which existed when these systems were being

deposited. These materials were washed down from the land to the sea, and there deposited. The several systems of Paleozoic rocks are distinguished from one another by their fossils. Thus, the fossils of the Cambrian system of rocks are sufficiently unlike those of the Ordovician system to be readily distinguished by paleontologists. Even at the beginning of the Cambrian period the range of life was great, all the great types which are living at the present time, except the vertebrates, being represented. Even the vertebrates may have lived, though relics of their existence have never been found. In this period trilobites and brachiopods were perhaps the most abundant and the most characteristic life, judged by the abundance of fossils. In the rocks of the Ordovician system fish-remains have been found and also relics of air-breathing life. Mollusks, crinoids and corals lived in great profusion, in addition to types of life which predominated in the Cambrian period. Most of the oil and gas of Ohio and Indiana come from the rocks of the Ordovician age. In the Silurian period the same general types of life were prevalent, but the species are so far unlike those of the preceding period as to be readily distinguished by those who are familiar with fossils. The Devonian period is often known as the Age of Fishes, on account of the abundance of fish-remains which have been found in the rocks of this system. It is far from certain, however, that fish were more abundant than now, and the variety of fish was probably less than at the present time. The Devonian was, however, the first period when fishes were abundant, so far as now known. The oil of Pennsylvania and Canada is largely derived from beds of the Devonian age. During the Carboniferous period there were extensive marshes in the United States and in some other parts of the world, in which vegetable-matter accumulated in great quantity. These marshes were subsequently submerged, and the vegetable matter was buried by sediments and ultimately converted into coal. Most of the coal of the United States east of the Great Plains was accumulated at this period. Plant-life was abundant, but the plants were largely of types now extinct. It was during this period, as far as now known, that reptilian life began. The Permian period represents a transition stage between the Paleozoic and the Mesozoic era. In the Permian period there was extensive glaciation in Australia, South Africa and India

The several systems of Paleozoic rocks have somewhat different distribution, and, since the area of the deposits of any period corresponds approximately with the submerged area of that period, the distribution of the several systems helps us to understand the relations of land and water during the several periods. In this way it is known that the relations of sea and land were different at different times. It would appear either that the continent repeatedly oscillated up and down, causing areas which were at one time submerged to rise to above the level of the water at another and areas which were land at one time to sink beneath the sea at another; or else that the sea-level itself fluctuated. If the sea-level rose, it would overspread the low lands; if it were lowered, it would cause areas which had been submerged to become land. How far the changes in geography were the result of land-oscillations and how far they were the result of oscillations of the sea-level has never been determined. So far as present knowledge goes, it would appear that the deep-sea bottom has at no time been land and that the areas which were alternately above and below sea-level were low when they were land, and covered by shallow water only when they were submerged.

The Mesozoic (formerly called secondary) era, as the term indicates, was the era when life intermediate between the ancient and the present existed. This era is divided into several periods, as indicated above. The Triassic formations of North America are somewhat widespread in the western third of the continent, but have but little development in the eastern part and none at all in the interior. During this period reptiles perhaps were the dominant type of life. They were not only numerous, but the individuals attained great size. The earliest remains of mammals date from this period. Marine life abounded, but departed notably from the types which had prevailed in the Paleozoic era. Vegetation was abundant, but of types now extinct or but meagerly represented. The Jurassic period followed, and the distribution of the Jurassic formations is similar to that of the Triassic. The life of this period was, however, somewhat different from that of the preceding, though the same general types abounded. The oldest remains of birds are found in the rocks of this period. The Jurassic period was followed by the Cretaceous or Chalk period. In the early part of this period chalk was not being deposited, but in the later part chalk-deposits were in process of formation in many parts of the earth. The chalk-deposits are made up, for the most part, of the shells of minute marine animals (see CHALK). The Cretaceous formations of North America are much more widespread than those of the Jurassic and Triassic periods. Their distribution indicates that a large part of the North American continent was submerged during some parts of the period. It was during the Cretaceous period that the modern types of plants and of fishes made their appearance. During the last stages of the Cretaceous period

extensive accumulations of vegetable-matter were made in the western third of the United States. These were subsequently converted into coal, mostly soft. The coal of the western part of the United States mostly belongs to the late stages of the Cretaceous period.

The Cenozoic era or era of modern life followed the Mesozoic. Mammals, the earliest remains of which are found in the rocks of the Triassic system, abounded during the Cenozoic era, while the huge reptiles which had been especially characteristic of the Mesozoic era had disappeared. Reptiles still existed as now, but they were of relatively small types, and their numbers appear to have been relatively few. As the Cenozoic era progressed, the forms of life approached more and more closely to those of the present time, and by the end of the Pliocene the life was nearly the same as that which now exists. The Pleistocene period was a remarkable one, on account of the great climatic changes which occurred at this time. The result of these climatic changes brought on a glacial climate, and an ice-sheet or series of ice-sheets covered something like 4,000,000 square miles in the northern part of North America. A large ice-sheet was developed, probably contemporaneously, on the continent of Europe, affecting especially its northwestern part. The history of the Glacial period has been worked out in sufficient detail, so that it is known that there was a series of ice-sheets and not a single one. That is, there were several glacial epochs, with intervening epochs when the ice largely or completely disappeared and the climate became genial. Most of the lakes, waterfalls, etc. of the northeastern part of the United States and of the region to the north owe their existence to the glaciation of the area where they occur. The ice reached its most southerly limit in Illinois, where it descended to about 37° 30′.

The duration of the earth's history is a matter which has received much attention, but no conclusions have been reached which can be relied upon, beyond the very general one that the history of the earth has been exceedingly long. Various conjectures as to the number of years occupied in bringing the earth to its present condition have been made. They range from twenty-five million or so to several hundred million. Geologists in general would not be surprised if it could be demonstrated that the history of the earth since Archean time has occupied 50,000,000 to 100,000,000 years. The Proterozoic era was perhaps as long as all subsequent time. The Paleozoic era was perhaps three to six times as long as the Mesozoic, and the Mesozoic was perhaps three or four times as long as the Cenozoic.

The climatic changes which the earth has undergone have been great, but their causes are not well-understood. There is little basis for the belief, formerly widespread, that the climate has on the whole been growing cooler. Cold periods seem to have alternated with warmer ones. Glaciation was extensive at the close of the Paleozoic and, again, late in the Cenozoic, and there is some indication of cold periods at other times. On the other hand the lands of high latitudes enjoyed genial climates during some parts of the earth's history, even as late as the mid-Tertiary time.

Volcanic activity seems to have been greater at some periods than at others, but on the whole to have been about as great, so far as now known, in the early as in the late stages of the earth's history. See Dana's *Manual of Geology;* Scott's *Introduction to Geology;* Le Conte's *Elements of Geology;* Geikie's *Text-Book of Geology.*

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Geom'etry in its origin was the science of measuring the surface of the earth (Greek *gē*, the earth, and *metron*, measure). With the ancient Egyptians, for instance, it took the form of mensuration, because of the need of a yearly survey of the lands that were left bare and muddy after each annual overflow of the Nile. Geometry now is the science of form; although, indeed, the exact geometrical forms are seldom found in nature. Perhaps one should begin to teach geometry as the Egyptians learned it, through making simple geometrical measurements and surveys in the play-ground, of baseball diamonds, hop-scotch courts, a lawn tennis court and so on. For, according to the strictly logical form of Euclid's teaching, it is seldom that a child perceives the need of geometry or begins with an interest in it. For this reason, too, geometrical properties should be taught in the first place largely by paper-folding and cutting, by the use of models, such as the kindergarten gifts, and by the graphical representation of facts that have to do with the other interests and studies of children. The classic work upon Geometry is still the *Elements* of Euclid, who wrote about 285 B. C. in the great days of Alexandria. But geometers of the 19th century declined to be bound by the *Elements*. There arose a *new geometry*, which began perhaps with Carnot. It certainly is necessary for the teacher of geometry to abandon the logical order of Euclid for a more practical and interesting and, in short, more psychological method.

Geoph'ilous Plants are those plants with special subterranean structures which enable them to pass through unfavorable seasons. For example, during a period of drought or cold the aerial parts of such plants disappear, but with the return of favorable conditions the underground parts

rapidly send new leaves or shoots to the surface. The underground structures are known variously as bulbs, corms, rootstocks etc. Not only does the geophilous habit serve to bridge over an unfavorable period, but it chiefly enables the plants to develop its working parts with great rapidity during the favorable season. This is a favorite habit with the so-called spring flowers, which usually grow in ravines or forests. These spring-plants must do their work between the first coming of spring-conditions and the coming of the shade produced by the forest foliage. Their working-season, therefore, is very short, and such plants appear above the ground with great rapidity, and their leaves and flowers are to be seen on every hand while the trees are only coming into foliage. The same result is seen when such plants live in dry regions, where the wet season is very short, and where the underground structures enable such plants to do all their work within a few weeks.

George I, son of Ernest Augustus, elector of Hannover, and great-grandson of James I of England, was born at Hannover, May 28, 1660. Immediately after the death of Queen Anne in 1714, he was proclaimed king of Great Britain and Ireland. Several risings on the part of the partisans of the Stuarts were put down in the early part of his reign. The king's personal part in the reign was slight, Sir Robert Walpole being the actual ruler. He was simply a figurehead and did little harm, mainly because of his lack of ability. He died on June 10, 1727. In this reign occurred the rise and fall of the celebrated South Sea Company. See histories of England by Stanhope, Hallam and Lecky.

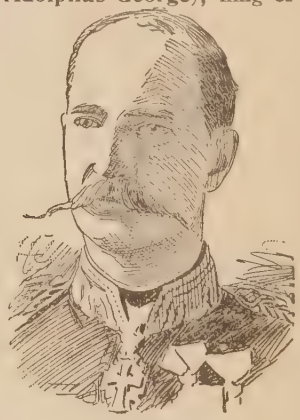
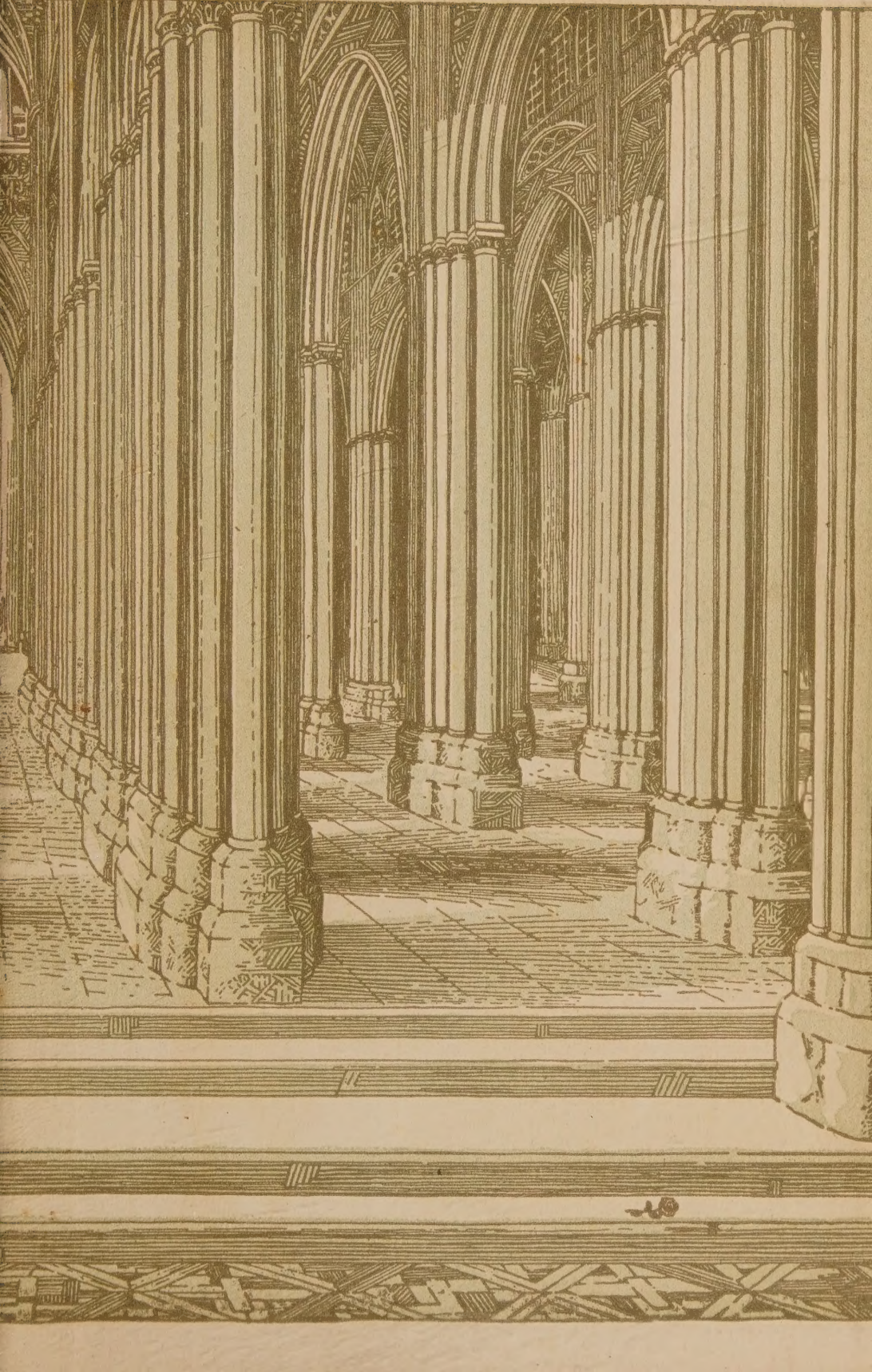
George II was born on Oct. 10, 1683, and succeeded his father as elector of Hannover and king of Great Britain and of Ireland. Though he interfered more than his father had done in the government, yet the policy pursued during his reign was simply that of his ministers, Walpole and Pitt. During Pitt's rule important wars were fought and much glory gained. Among the memorable victories were that of Clive at Plassey and that of Wolfe at Quebec. George II died on Oct. 26, 1760. See histories of England by Stanhope and Lecky; also Thackeray's *History of the Four Georges* and McCarthy's.

George III was born at London, June 4, 1738, and ascended the English throne on the death of his grandfather, George II. Though at the outset very popular, his obstinacy caused him later to lose this popularity, but he regained it in the later years of his reign. He was well-meaning and patriotic, and his long reign of over 60 years was one of the most noteworthy in English history. His obstinacy, however, and the determined spirit of the American colonists lost England the 13 colonies. Notable battles were fought during his reign in America, India and Europe. Great statesmen, such as Chatham, Pitt, Burke and Fox flourished; and great captains, naval and military, such as Nelson and Wellington, made their names immortal. During the last years of his life he was hopelessly insane. He died Jan. 29, 1820.

George V, King of Great Britain and Ireland, was born June 5, 1865, the second son of Albert Edward, Prince of Wales, afterward King Edward VII. He entered the navy as cadet in 1877, passed through the different grades and was promoted to Commander in 1891. He was created Prince of Wales in 1901, after the death of his elder brother. In 1893 he married Princess Victoria Mary, daughter of the Duke of Teck. He succeeded to the throne on the death of his father, Edward VII, May 6, 1910.

George IV, the oldest son of George III, was born on Aug. 12, 1762. He became prince-regent when his father became insane, and was crowned king of England on his father's death. Little of importance took place during his reign. Besides his many vices and failings, George IV is remembered for his taste for music and literature. He died on June 26, 1830. See Thackeray's *History of the Four Georges.*

George I (Christian William Ferdinand Adolphus George), king of Greece, was the second son of the late King Christian IX of Denmark and brother of the dowager-empress of Russia and of Queen Alexandra of England. He was born at Copenhagen, Dec. 24, 1845, and served for some time in the Danish navy. On the abdication, in 1863, of King Otho I of Greece, the vacant throne was offered by the national assembly at Athens to Prince Christian of Denmark, who, accepting the crown, became king of the Hellenes with the title of George I. In 1867 King George married Princess Olga, daughter of Grandduke Constantine of Russia, brother of the late Emperor Alexander II. In 1898 an attempt, which happily failed, was made to assassinate him. On March 18, 1913, he was assassinated by an anarchist while walking in the streets of Salonica. His eldest son succeeded him as Constantine I.



GEORGE I